EIGHTH EDITION

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FRANK H. NETTER, MD

NETTER ATLAS of HUMAN ANATOMY

Classic Regional Approach

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PREFACE

The illustrations comprising the *Netter Atlas of Human Anatomy* were painted by physician-artists, Frank H. Netter, MD, and Carlos Machado, MD. Dr. Netter was a surgeon and Dr. Machado is a cardiologist. Their clinical insights and perspectives have informed their approaches to these works of art. The collective expertise of the anatomists, educators, and clinicians guiding the selection, arrangement, labeling, and creation of the illustrations ensures the accuracy, relevancy, and educational power of this outstanding collection.

You have a copy of the **regionally organized** 8th edition with English language terminology. This is the traditional organization and presentation that has been used since the first edition. Also available is a Latin terminology option that is also regionally organized, as well as an option with English terminology organized by body system. In all cases, the same beautiful and instructive Art Plates and Table information are included.

New to this Edition

New Art

More than 20 new illustrations have been added and over 30 art modifications have been made throughout this edition. Highlights include new views of the temporal and infratemporal fossa, pelvic fascia, nasal cavity and paranasal sinuses, plus multiple new perspectives of the heart, a cross-section of the foot, enhanced surface anatomy plates, and overviews of many body systems. In these pages you will find the most robust illustrated coverage to date for modern clinical anatomy courses.

Terminology and Label Updates

This 8th edition incorporates terms of the *Terminologia Anatomica* (2nd edition), as published by the Federative International Programme on Anatomical Terminology in 2019 (https://fipat.library.dal.ca/ta2) and adopted by the International Federation of Associations of Anatomy in 2020. A fully searchable database of the updated *Terminologia Anatomica* can be accessed at https://ta2viewer.openanatomy.org. Common clinical eponyms and former terminologies are selectively included, parenthetically, for clarity. In addition, a strong effort has been made to reduce label text on the page while maximizing label information through the use of abbreviations (muscle/s = m/mm.; artery/ies = a./aa.; vein/s = v./vv.; and nerve/s = n./nn.) and focusing on the labels most relevant to the subject of each Plate.

Nerve Tables

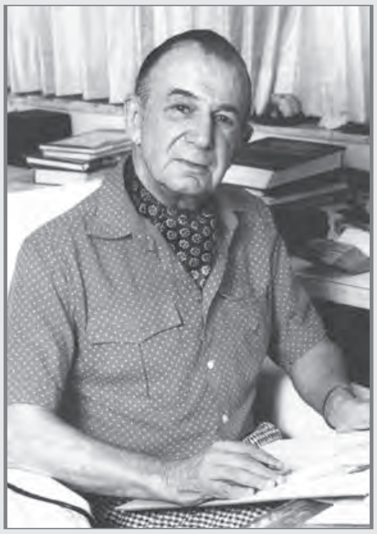
The muscle tables and clinical tables of previous editions have been so positively received that new tables have been added to cover four major nerve groups: cranial nerves and the nerves of the cervical, brachial, and lumbosacral plexuses.

Future of the Netter Anatomy Atlas

As the Netter Atlas continues to evolve to meet the needs of students, educators, and clinicians, we welcome suggestions! Please use the following form to provide your feedback:

https://tinyurl.com/NetterAtlas8

Frank H. Netter, M.D.



To my dear wife, Vera

PREFACE TO THE FIRST EDITION

I have often said that my career as a medical artist for almost 50 years has been a sort of "command performance" in the sense that it has grown in response to the desires and requests of the medical profession. Over these many years, I have produced almost 4,000 illustrations, mostly for *The CIBA* (now *Netter*) *Collection of Medical Illustrations* but also for *Clinical Symposia.* These pictures have been concerned with the varied subdivisions of medical knowledge such as gross anatomy, histology, embryology, physiology, pathology, diagnostic modalities, surgical and therapeutic techniques, and clinical manifestations of a multitude of diseases. As the years went by, however, there were more and more requests from physicians and students for me to produce an atlas purely of gross anatomy. Thus, this atlas has come about, not through any inspiration on my part but rather, like most of my previous works, as a fulfillment of the desires of the medical profession.

It involved going back over all the illustrations I had made over so many years, selecting those pertinent to gross anatomy, classifying them and organizing them by system and region, adapting them to page size and space, and arranging them in logical sequence. Anatomy of course does not change, but our understanding of anatomy and its clinical significance does change, as do anatomical terminology and nomenclature. This therefore required much updating of many of the older pictures and even revision of a number of them in order to make them more pertinent to today's ever-expanding scope of medical and surgical practice. In addition, I found that there were gaps in the portrayal of medical knowledge as pictorialized in the illustrations I had previously done, and this necessitated my making a number of new pictures that are included in this volume.

In creating an atlas such as this, it is important to achieve a happy medium between complexity and simplification. If the pictures are too complex, they may be difficult and confusing to read; if oversimplified, they may not be adequately definitive or may even be misleading. I have therefore striven for a middle course of realism without the clutter of confusing minutiae. I hope that the students and members of the medical and allied professions will find the illustrations readily understandable, yet instructive and useful.

At one point, the publisher and I thought it might be nice to include a foreword by a truly outstanding and renowned anatomist, but there are so many in that category that we could not make a choice. We did think of men like Vesalius, Leonardo da Vinci, William Hunter, and Henry Gray, who of course are unfortunately unavailable, but I do wonder what their comments might have been about this atlas.

Frank H. Netter, MD
(1906–1991)

FRANK H. NETTER, MD

Frank H. Netter was born in New York City in 1906. He studied art at the Art Students League and the National Academy of Design before entering medical school at New York University, where he received his Doctor of Medicine degree in 1931. During his student years, Dr. Netter's notebook sketches attracted the attention of the medical faculty and other physicians, allowing him to augment his income by illustrating articles and textbooks. He continued illustrating as a sideline after establishing a surgical practice in 1933, but he ultimately opted to give up his practice in favor of a full-time commitment to art. After service in the United States Army during World War II, Dr. Netter began his long collaboration with the CIBA Pharmaceutical Company (now Novartis Pharmaceuticals). This 45-year partnership resulted in the production of the extraordinary collection of medical art so familiar to physicians and other medical professionals worldwide.

Icon Learning Systems acquired the Netter Collection in July 2000 and continued to update Dr. Netter's original paintings and to add newly commissioned paintings by artists trained in the style of Dr. Netter. In 2005, Elsevier Inc. purchased the Netter Collection and all publications from Icon Learning Systems. There are now over 50 publications featuring the art of Dr. Netter available through Elsevier Inc.

Dr. Netter's works are among the finest examples of the use of illustration in the teaching of medical concepts. The 13-book *Netter Collection of Medical Illustrations,* which includes the greater part of the more than 20,000 paintings created by Dr. Netter, became and remains one of the most famous medical works ever published. *The Netter Atlas of Human Anatomy,* first published in 1989, presents the anatomic paintings from the Netter Collection. Now translated into 16 languages, it is the anatomy atlas of choice among medical and health professions students the world over.

The Netter illustrations are appreciated not only for their aesthetic qualities, but, more importantly, for their intellectual content. As Dr. Netter wrote in 1949 "clarification of a subject is the aim and goal of illustration. No matter how beautifully painted, how delicately and subtly rendered a subject may be, it is of little value as a *medical illustration* if it does not serve to make clear some medical point." Dr. Netter's planning, conception, point of view, and approach are what inform his paintings and what make them so intellectually valuable.

Frank H. Netter, MD, physician and artist, died in 1991.

ABOUT THE EDITORS

Carlos A.G. Machado, MD was chosen by Novartis to be Dr. Netter's successor. He continues to be the main artist who contributes to the Netter collection of medical illustrations.

Self-taught in medical illustration, cardiologist Carlos Machado has contributed meticulous updates to some of Dr. Netter's original plates and has created many paintings of his own in the style of Netter as an extension of the Netter collection. Dr. Machado's photorealistic expertise and his keen insight into the physician/patient relationship inform his vivid and unforgettable visual style. His dedication to researching each topic and subject he paints places him among the premier medical illustrators at work today.

Learn more about his background and see more of his art at: https://netterimages.com/artist-carlos-a-g-machado.html

Paul E. Neumann, MD was clinically trained in anatomical pathology and neuropathology. Most of his research publications have been in mouse neurogenetics and molecular human genetics. In the past several years, he has concentrated on the anatomical sciences, and has frequently written about anatomical terminology and anatomical ontology in the journal *Clinical Anatomy*. As an officer of the Federative International Programme for Anatomical Terminology (FIPAT), he participated in the production of Terminologia Anatomica (2nd edition), Terminologia Embryologica (2nd edition), and Terminologia Neuroanatomica. In addition to serving as the lead Latin editor of the 8th edition of Netter's Atlas, he was a contributor to the 33rd edition of *Dorland's Illustrated Medical Dictionary*.

R. Shane Tubbs, MS, PA-C, PhD is a native of Birmingham, Alabama and a clinical anatomist. His research interests are centered around clinical/surgical problems that are identified and solved with anatomical studies. This investigative paradigm in anatomy as resulted in over 1,700 peer reviewed publications. Dr. Tubbs' laboratory has made novel discoveries in human anatomy including a new nerve to the skin of the lower eyelid, a new space of the face, a new venous sinus over the spinal cord, new connections between the parts of the sciatic nerve, new ligaments of the neck, a previously undescribed cutaneous branch of the inferior gluteal nerve, and an etiology for postoperative C5 nerve palsies. Moreover, many anatomical feasibility studies from Dr. Tubbs' laboratory have gone on to be used by surgeons from around the world and have thus resulted in new surgical/clinical procedures such as treating hydrocephalus by shunting cerebrospinal fluid into various bones, restoration of upper limb function in paralyzed patients with neurotization procedures using the contralateral spinal accessory nerve, and harvesting of clavicle for anterior cervical discectomy and fusion procedures in patients with cervical instability or degenerative spine disease.

Dr. Tubbs sits on the editorial board of over 15 anatomical journals and has reviewed for over 150 scientific journals. He has been a visiting professor to major institutions in the United States and worldwide. Dr. Tubbs has authored over 40 books and over 75 book chapters. His published books by Elsevier include *Gray's Anatomy Review*, *Gray's Clinical Photographic Dissector of the Human Body*, *Netter's Introduction to Clinical Procedures*, and *Nerves and Nerve Injuries* volumes I and II. He is an editor for the 41st and 42nd editions of the over 150-year-old *Gray's Anatomy*, the 5th through 8th editions of *Netter's Atlas of Anatomy*, and is the editor-in-chief of the journal *Clinical Anatomy*. He is the Chair of the Federative International Programme on Anatomical Terminologies (FIPAT).

Jennifer K. Brueckner-Collins, PhD is a proud Kentucky native. She pursued her undergraduate and graduate training at the University of Kentucky. During her second year of graduate school there, she realized that her professional calling was not basic science research in skeletal muscle biology, but was instead helping medical students master the anatomical sciences. She discovered this during a required teaching assistantship in medical histology, where working with students at the 10-headed microscope changed her career path.

The next semester of graduate school, she assisted in teaching dissection-based gross anatomy, although she had taken anatomy when the lab component was prosection based. After teaching in the first lab, she knew that she needed to learn anatomy more thoroughly through dissection on her own, so she dissected one to two labs ahead of the students that semester; that was when she really learned anatomy and was inspired to teach this discipline as a profession. All of this occurred in the early 1990s, when pursuing a teaching career was frowned upon by many; it was thought that you only pursued this track if you were unsuccessful in research. She taught anatomy part-time during the rest of her graduate training, on her own time, to gain requisite experience to ultimately secure a faculty position.

Dr. Brueckner-Collins spent 10 years at the University of Kentucky as a full-time faculty member teaching dissection-based gross anatomy to medical, dental, and allied health students. Then, after meeting the love of her life, she moved to the University of Louisville and has taught medical and dental students there for more than a decade. Over 20 years of teaching full time at two medical schools in the state, her teaching efforts have been recognized through receipt of the highest teaching honor at each medical school in the state, the Provost's Teaching Award at University of Kentucky, and the Distinguished Teaching Professorship at University of Louisville.

Martha Johnson Gdowski, PhD earned her BS in Biology cum laude from Gannon University in 1990, followed by a PhD in Anatomy from the Pennsylvania State University College of Medicine in 1995. She completed postdoctoral fellowships at the Cleveland Clinic and Northwestern University School of Medicine prior to accepting a faculty position in the Department of Neuroscience at the University of Rochester School of Medicine and Dentistry in 2001. Previous research interests include the development of an adult model of hydrocephalus, sensorimotor integration in the basal ganglia, and sensorimotor integration in normal and pathological aging.

Her passion throughout her career has been in her service as an educator. Her teaching has encompassed a variety of learning formats, including didactic lecture, laboratory, journal club, and problem-based learning. She has taught for four academic institutions in different capacities (The Pennsylvania State University School of Medicine, Northwestern University School of Medicine, Ithaca College, and The University of Rochester School of Medicine and Dentistry). She has taught in the following curricula: Undergraduate and Graduate Neuroscience, Graduate Neuroanatomy, Graduate Human Anatomy and Physiology for Physical Therapists, Undergraduate Medical Human Anatomy and Histology, and Undergraduate and Graduate Human Anatomy. These experiences have provided an opportunity to instruct students that vary in age, life experience, race, ethnicity, and economic background, revealing how diversity in student populations enriches learning environments in ways that benefit everyone. She has been honored to be the recipient of numerous awards for her teaching and mentoring of students during their undergraduate medical education. Martha enjoys gardening, hiking, and swimming with her husband, Greg Gdowski, PhD, and their dogs, Sophie and Ivy.

Virginia T. Lyons, PhD is an Associate Professor of Medical Education and the Associate Dean for Preclinical Education at the Geisel School of Medicine at Dartmouth. She received her BS in Biology from Rochester Institute of Technology and her PhD in Cell Biology and Anatomy from the University of North Carolina at Chapel Hill. Dr. Lyons has devoted her career to education in the anatomical sciences, teaching gross anatomy, histology, embryology, and neuroanatomy to medical students and other health professions students. She has led courses and curricula in human gross anatomy and embryology for more than 20 years and is a strong advocate for incorporating engaged pedagogies into preclinical medical education. Dr. Lyons has been recognized with numerous awards for teaching and mentoring students and was elected to the Dartmouth chapter of the Alpha Omega Alpha Honor Medical Society. She is the author of *Netter's Essential Systems-Based Anatomy* and co-author of the Human Anatomy Learning Modules website accessed by students worldwide. Dr. Lyons also serves as the Discipline Editor for Anatomy on the Aquifer Sciences Curriculum Editorial Board, working to integrate anatomical concepts into virtual patient cases that are used in multiple settings including clerkships and residency training.

Peter J. Ward, PhD grew up in Casper, Wyoming, graduating from Kelly Walsh High School and then attending Carnegie Mellon University in Pittsburgh, Pennsylvania. He began graduate school at Purdue University, where he first encountered gross anatomy, histology, embryology, and neuroanatomy. Having found a course of study that engrossed him, he helped teach those courses in the veterinary and medical programs at Purdue. Dr. Ward completed a PhD program in anatomy education and, in 2005, he joined the faculty at the West Virginia School of Osteopathic Medicine (WVSOM) in Lewisburg, West Virginia. There he has taught gross anatomy, embryology, neuroscience, histology, and the history of medicine. Dr. Ward has received numerous teaching awards, including the WVSOM Golden Key Award, the Basmajian Award from the American Association of Anatomists, and has been a two-time finalist in the West Virginia Merit Foundation's Professor of the Year selection. Dr. Ward has also been director of the WVSOM plastination facility, coordinator of the anatomy graduate teaching assistants, chair of the curriculum committee, chair of the faculty council, creator and director of a clinical anatomy elective course, and host of many anatomy-centered events between WVSOM and two Japanese Colleges of Osteopathy. Dr. Ward has also served as council member and association secretary for the American Association of Clinical Anatomists. In conjunction with Bone Clones, Inc., Dr. Ward has produced tactile models that mimic the feel of anatomical structures when intact and when ruptured during the physical examination. He created the YouTube channel Clinical Anatomy Explained! and continues to pursue interesting ways to present the anatomical sciences to the public. Dr. Ward was the Senior Associate Editor for the three volumes of *The Netter Collection: The Digestive System*, 2nd Edition, a contributor to *Gray's Anatomy,* 42nd Edition, and is author of *Netter's Integrated Musculoskeletal System: Clinical Anatomy Explained.*

Brion Benninger, MD, MBChB, MSc currently teaches surgical, imaging, and dynamic anatomy to medical students and residents in several countries (United States, New Zealand, China, Japan, Korea, Taiwan, The Caribbean, Mexico). He develops, invents, and assesses ultrasound probes, medical equipment, simulations, and software while identifying dynamic anatomy. He enjoys mixing educational techniques integrating macro imaging and surgical anatomy. Dr. Benninger developed the teaching theory of anatomy deconstruction/reconstruction and was the first to combine ultrasound with Google Glass during physical examination, coining the term "triple feedback examination." An early user of ultrasound, he continues to develop eFAST teaching and training techniques, has developed and shares a patent on a novel ultrasound finger probe, and is currently developing a new revolutionary ultrasound probe for breast screening. He is a reviewer for several ultrasound, clinical anatomy, surgical, and radiology journals and edits and writes medical textbooks. His research interests integrate clinical anatomy with conventional and emerging technologies to improve training techniques in situ and simulation. Dr. Benninger pioneered and coined the term "dynamic anatomy," developed a technique to deliver novel contrast medium to humans, and was the first to reveal vessels and nerves not previously seen using CT and MRI imaging. He has mentored more than 200 students on over 350 research projects presented at national and international conferences and has received numerous awards for projects related to emergency procedures, ultrasound, sports medicine, clinical anatomy, medical simulation, reverse translational research, medical education, and technology. He is proud to have received medical teaching awards from several countries and institutions, including being the first recipient in more than 25 years to receive the Commendation Medal Award from the Commission of Osteopathic Accreditation for innovative clinical anatomy teaching that he designed and facilitated in Lebanon, Oregon. Dr. Benninger has received sports medicine accolades from Sir Roger Bannister regarding his medical invention on shoulder proprioception. He is also Executive Director of the Medical Anatomy Center and collaborates with colleagues globally from surgical and nonsurgical specialties. He is also an invited course speaker for surgical anatomy in New Zealand. Dr. Benninger collects medical history books, loves mountains and sports, and is an anonymous restaurant critic. British mentors directly responsible for his training include Prof. Peter Bell (surgery), Prof. Sir Alec Jeffreys (genetic fingerprinting), Profs. David deBono and Tony Gershlick (cardiology), Prof. Roger Greenhalgh (vascular surgery), Profs. Chris Colton, John Webb, and Angus Wallace (orthopaedics), Prof. Harold Ellis CBE (surgery and clinical anatomy), and Prof. Susan Standring (Guys Hospital/Kings College).

Todd M. Hoagland, PhD is Clinical Professor of Biomedical Sciences and Occupational Therapy at Marquette University in the College of Health Sciences. Previously he was Professor of Anatomy at the Medical College of Wisconsin (MCW). Prior to MCW, Dr. Hoagland was at Boston University School of Medicine (BUSM) and he still holds an adjunct faculty position at Boston University Goldman School of Dental Medicine. Dr. Hoagland is a passionate teacher and is dedicated to helping students achieve their goals. He believes in being a strong steward of the anatomical sciences, which involves teaching it to students while contemporaneously developing resources to improve the transfer of knowledge and preparing the next generation to be even better teachers. While at BUSM, Dr. Hoagland was a leader for the Carnegie Initiative on the Doctorate in Neuroscience and helped develop the Vesalius Program (teacher training) for graduate students. The program ensures that graduate students learn about effective teaching, receive authentic experiences in the classroom, and understand how to share what they learn via scholarship.

Dr. Hoagland's dedication to health professions education has been richly rewarded by numerous teaching awards from the University of Notre Dame, BUSM, and MCW. Dr. Hoagland received the Award for Outstanding Ethical Leadership in 2009, was inducted into the Alpha Omega Alpha Honor Medical Society in 2010, received the American Association of Anatomists Basmajian Award in 2012, and was inducted into the Society of Teaching Scholars in 2012 and was their director from 2016–2020.

Dr. Hoagland's scholarly activity centers on (1) evaluating content and instructional/learning methodology in Clinical Human Anatomy and Neuroanatomy courses, especially as relevant to clinical practice, (2) translating basic anatomical science research findings into clinically meaningful information, and (3) evaluating professionalism in students to enhance their self-awareness and improve patient care outcomes. Dr. Hoagland is also consulting editor for *Netter's Atlas of Human Anatomy,* co-author for the digital anatomy textbook *AnatomyOne,* and lead author for *Clinical Human Anatomy Dissection Guide*.

ACKNOWLEDGMENTS

Carlos A. G. Machado, MD

With the completion of this 8th edition, I celebrate 27 years contributing to the Netter brand of educational products, 25 years of which have been dedicated to the update—seven editions—of this highly prestigious, from birth, *Atlas of Human Anatomy*. For these 25 years I have had the privilege and honor of working with some of the most knowledgeable anatomists, educators, and consulting editors—my treasured friends—from whom I have learned considerably.

For the last 16 years it has also been a great privilege to be part of the Elsevier team and be under the skillful coordination and orientation of Marybeth Thiel, Elsevier's Senior Content Development Specialist, and Elyse O'Grady, Executive Content Strategist. I thank both for their friendship, support, sensibility, and very dedicated work.

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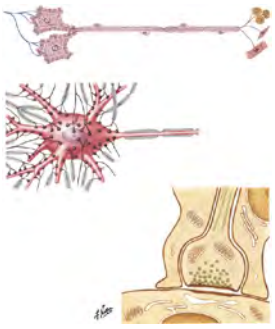
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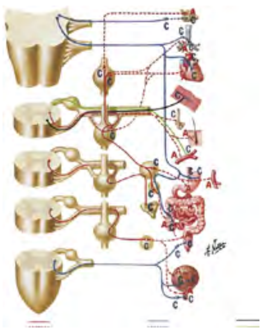
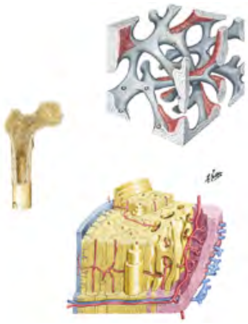
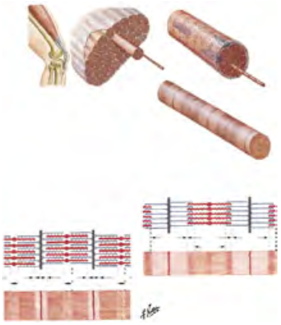

BP 8 Cholinergic and Adrenergic Synapses: Schema

ELECTRONIC BONUS PLATES—*cont'd*

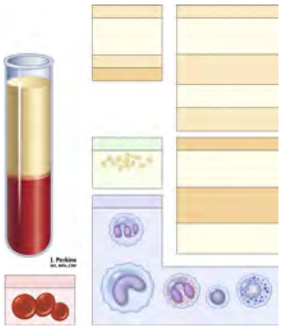


BP 9 Architecture of Bone



BP 10 Muscle Structure

BP 11 Joints: Connective Tissues and Articular Cartilage



BP 12 Cardiovascular System: Composition of Blood

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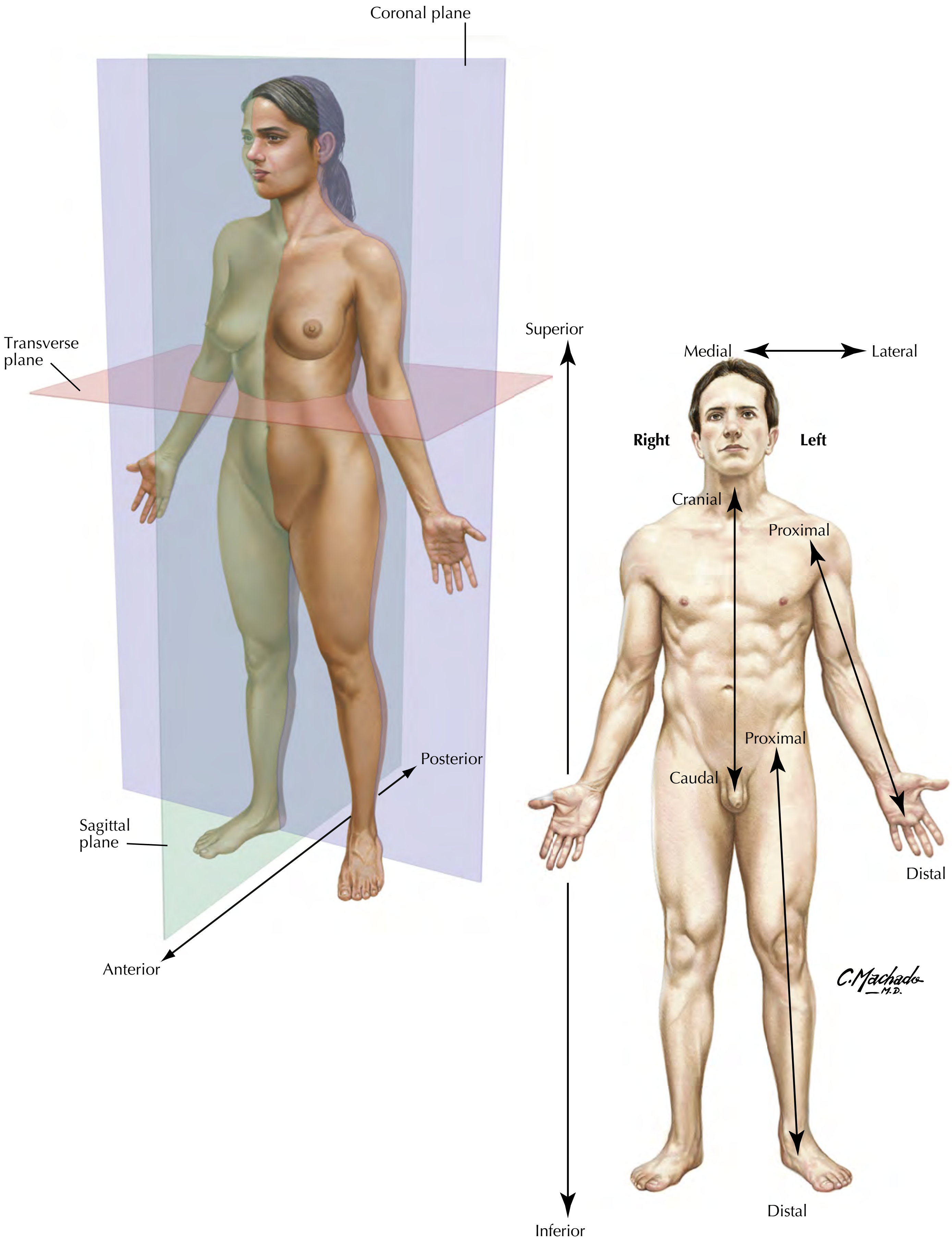
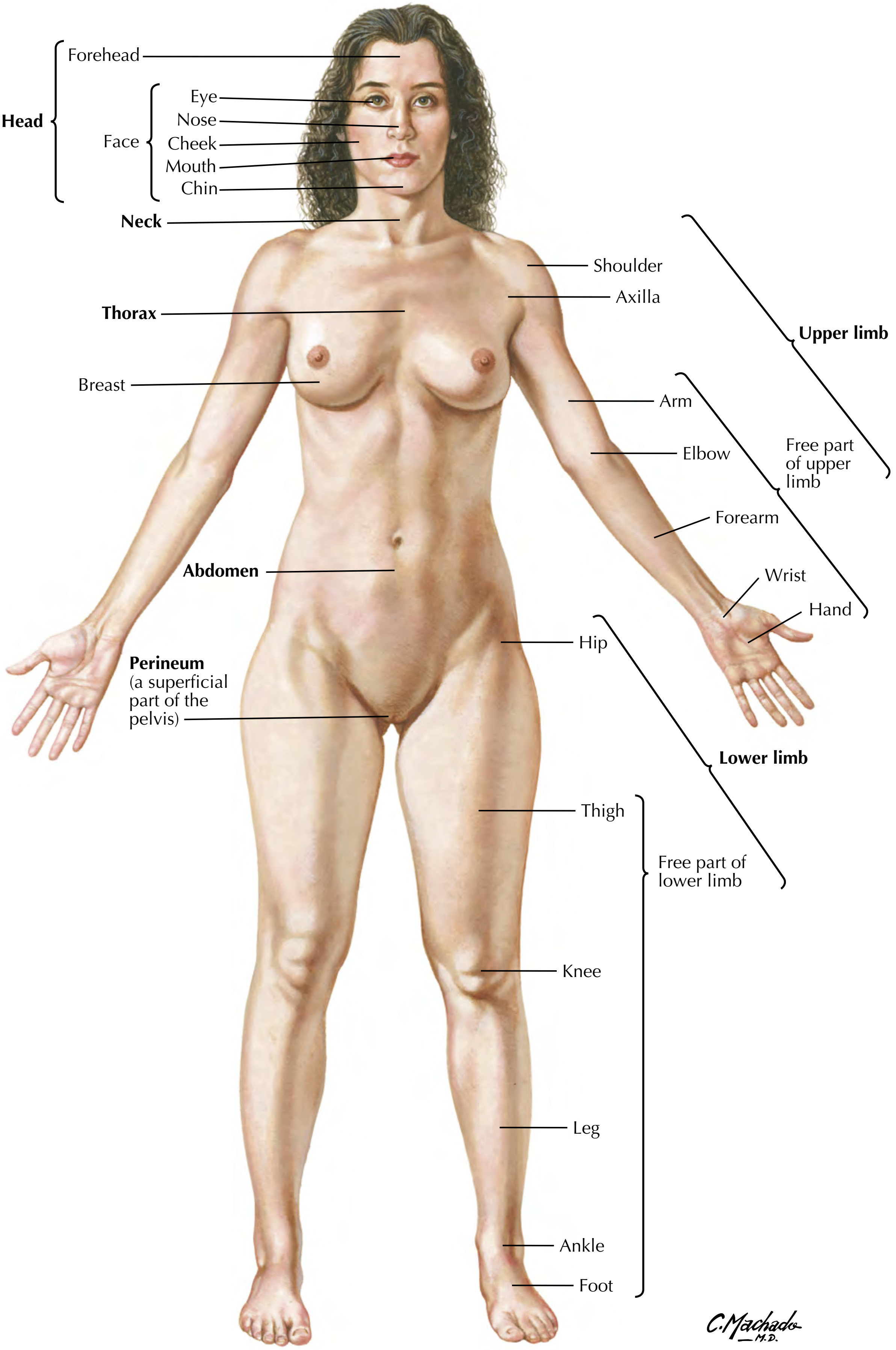
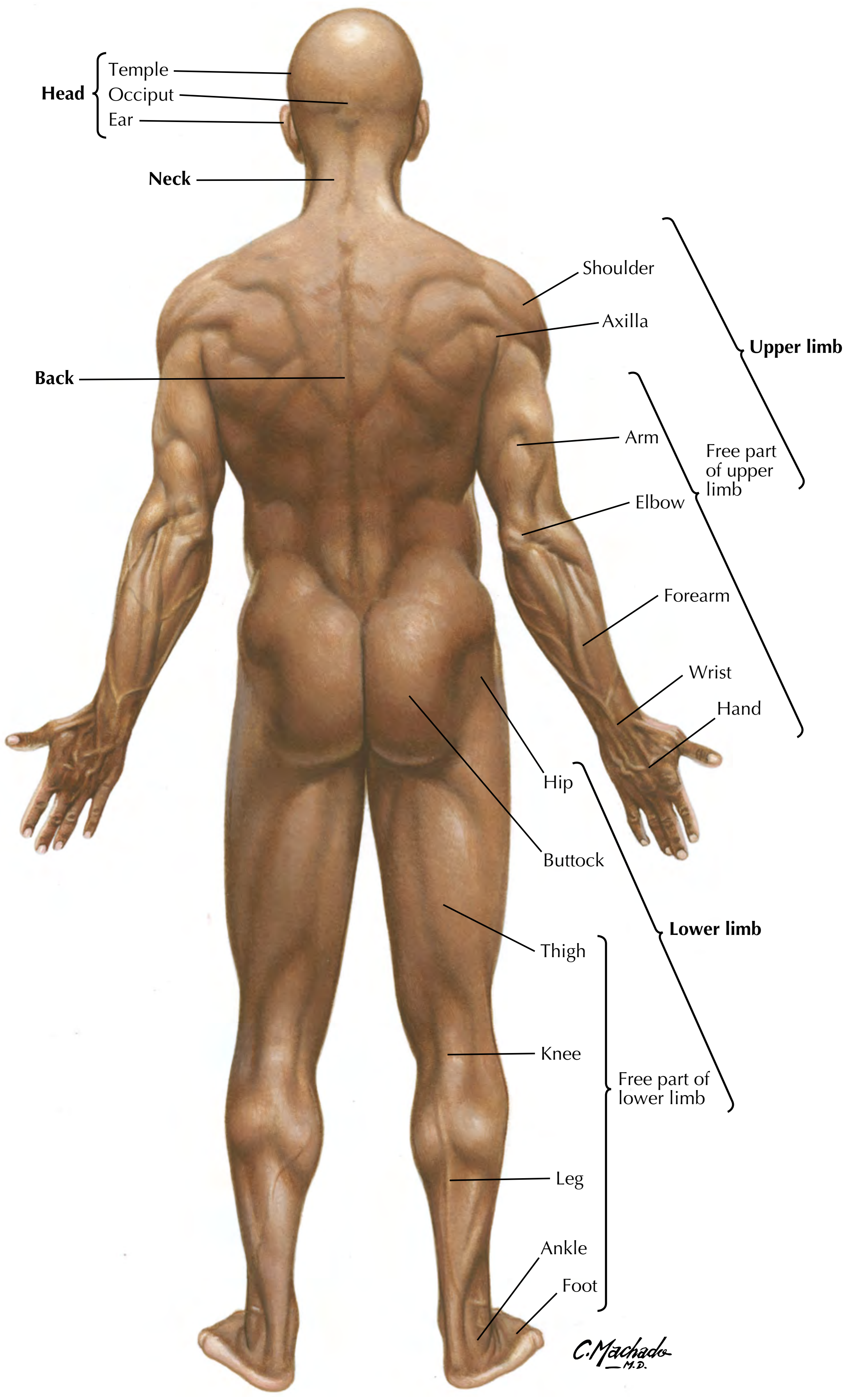
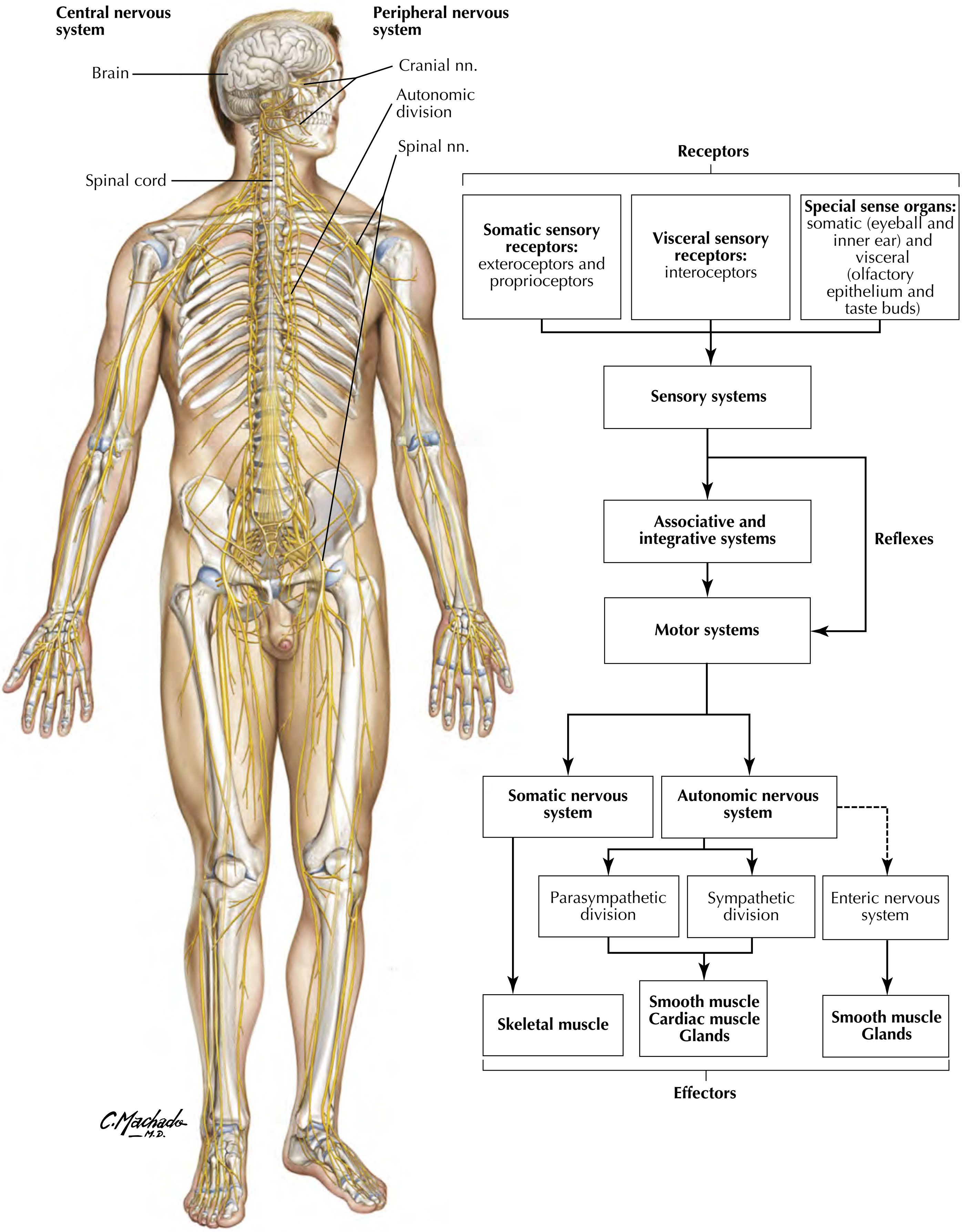

Coronal plane
Transverse plane
Sagittal plane
Posterior
Anterior
Superior
Inferior
Medial
Lateral
Right
Left
Cranial
Caudal
Proximal
Distal
Proximal
Distal
C.Machado M.D.


Head
Forehead
Face
Eye
Nose
Cheek
Mouth
Chin
Neck
Thorax
Breast
Abdomen
Perineum
(a superficial part of the pelvis)
Shoulder
Axilla
Upper limb
Arm
Elbow
Free part of upper limb
Forearm
Wrist
Hand
Hip
Lower limb
Thigh
Free part of lower limb
Knee
Leg
Ankle
Foot

C. Machado M.D.

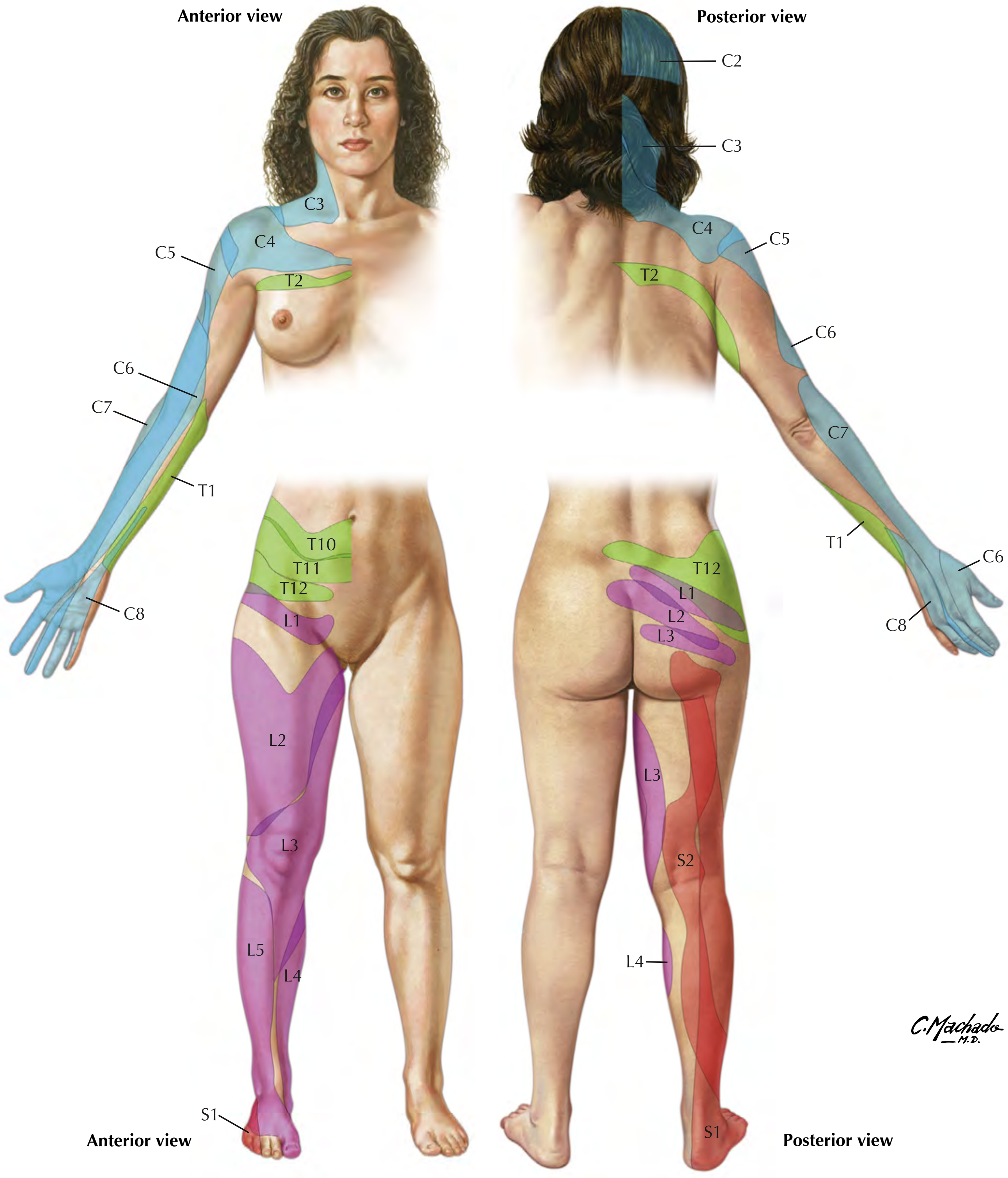

Head
Temple
Occiput
Ear
Neck
Back
Shoulder
Axilla
Upper limb
Arm
Free part of upper limb
Elbow
Forearm
Wrist
Hand
Hip
Buttock
Lower limb
Thigh
Knee
Free part of lower limb
Leg
Ankle
Foot
C. Machado M.D.

Overview of Nervous System


Central nervous system
Brain
Spinal cord
Peripheral nervous system
Cranial nn.
Autonomic division
Spinal nn.
Receptors
Somatic sensory receptors: exteroceptors and proprioceptors
Visceral sensory receptors: interoceptors
Special sense organs: somatic (eyeball and inner ear) and visceral (olfactory epithelium and taste buds)
Sensory systems
Associative and integrative systems
Reflexes
Motor systems
Somatic nervous system
Autonomic nervous system
Parasympathetic division
Sympathetic division
Enteric nervous system
Skeletal muscle
Smooth muscle
Cardiac muscle
Glands
Smooth muscle
Glands
Effectors

Dermatomes of Upper and Lower Limbs

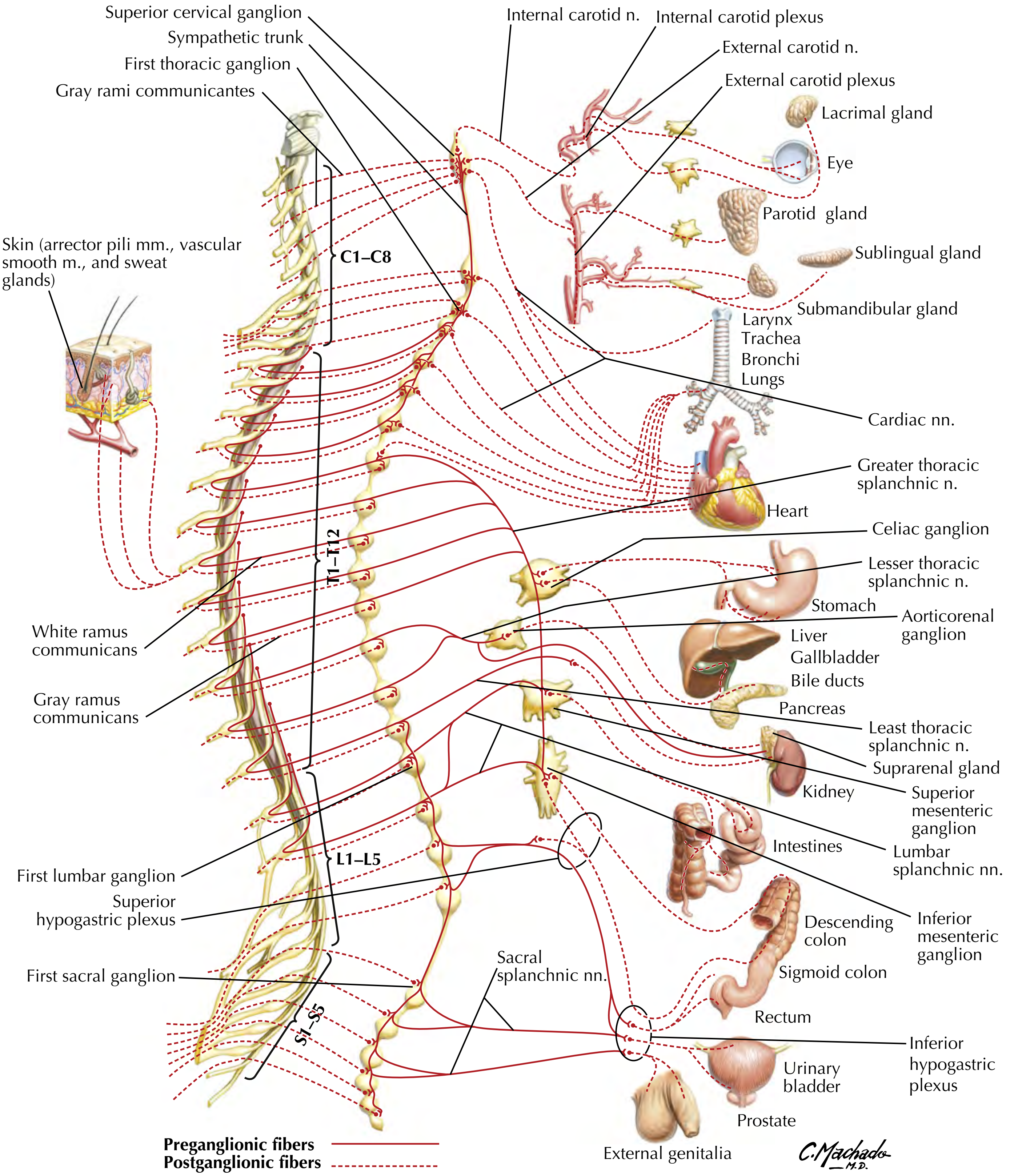
See also **Plate 188**


Anterior view
Posterior view
C2
C3
C4
C5
C6
C7
C8
T1
T2
C3
C4
C5
C6
C7
T1
C8
T10
T11
T12
L1
L2
L3
L5
L4
S1
T12
L1
L2
L3
L3
S2
L4
S1
Anterior view
Posterior view
C.Machado M.D.

Schematic based on Lee MW, McPhee RW, Stringer MD. An evidence-based approach to human dermatomes. Clin Anat. 2008;21(5):363–373. doi: 10.1002/ca.20636. PMID: 18470936. Please note that these areas are not absolute and vary from person to person. S3, S4, S5, and Co supply the perineum but are not shown for reasons of clarity. Of note, the dermatomes are larger than illustrated as the figure is based on best evidence; gaps represent areas in which the data are inconclusive.

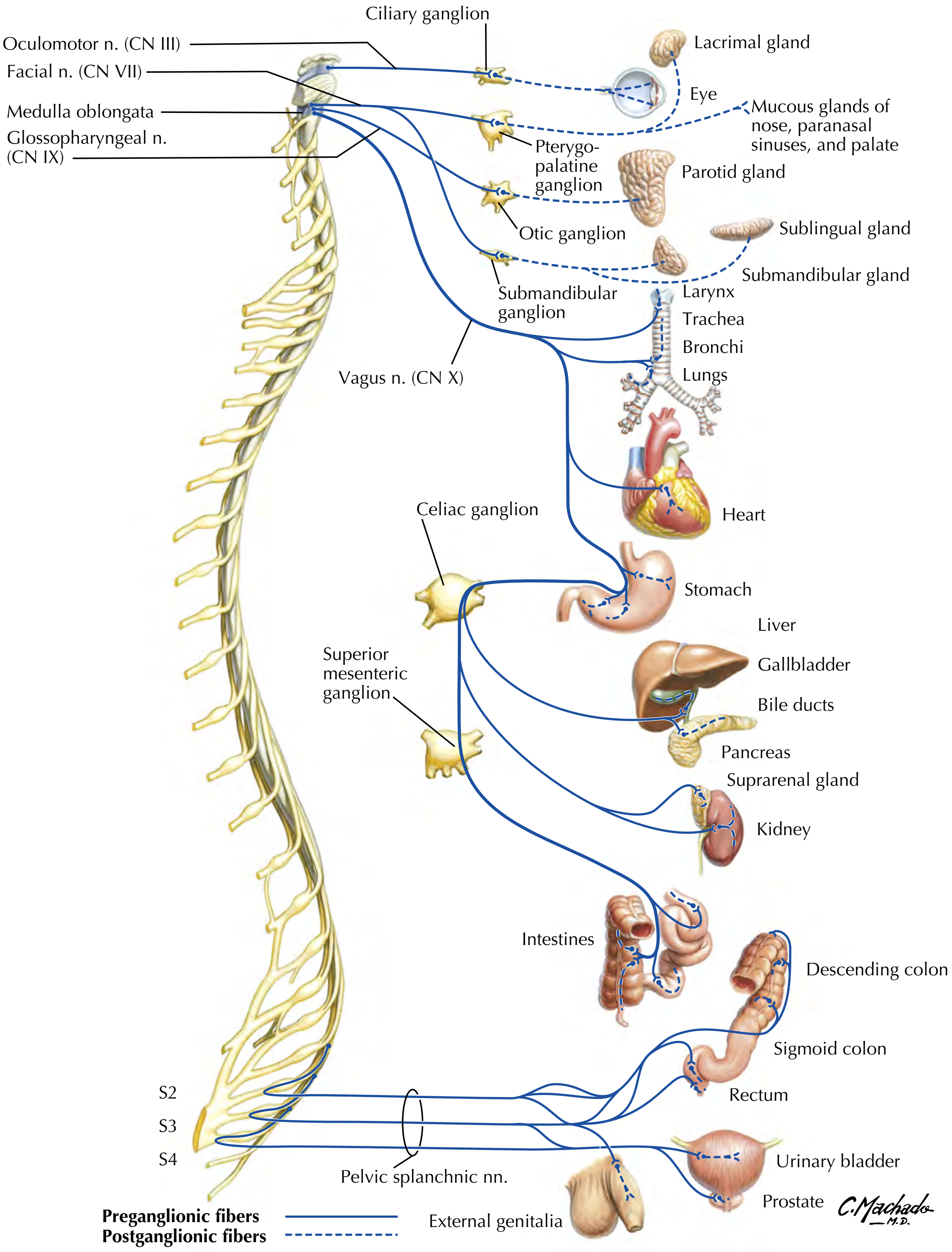
Sympathetic Nervous System: Schema

See also **Plates 229, 249, 341, BP 6, BP 8, BP 52**


Superior cervical ganglion
Sympathetic trunk
First thoracic ganglion
Gray rami communicantes
Skin (arrector pili mm., vascular smooth m., and sweat glands)
C1–C8
T1–T12
L1–L5
S1–S5
White ramus communicans
Gray ramus communicans
First lumbar ganglion
Superior hypogastric plexus
First sacral ganglion
Sacral splanchnic nn.
Internal carotid n.
Internal carotid plexus
External carotid n.
External carotid plexus
Lacrimal gland
Eye
Parotid gland
Sublingual gland
Submandibular gland
Larynx
Trachea
Bronchi
Lungs
Cardiac nn.
Greater thoracic splanchnic n.
Heart
Celiac ganglion
Lesser thoracic splanchnic n.
Stomach
Aorticorenal ganglion
Liver
Gallbladder
Bile ducts
Pancreas
Least thoracic splanchnic n.
Suprarenal gland
Kidney
Superior mesenteric ganglion
Intestines
Lumbar splanchnic nn.
Inferior mesenteric ganglion
Descending colon
Sigmoid colon
Rectum
Inferior hypogastric plexus
Urinary bladder
Prostate
External genitalia
Preganglionic fibers
Postganglionic fibers
C.Machado M.D.

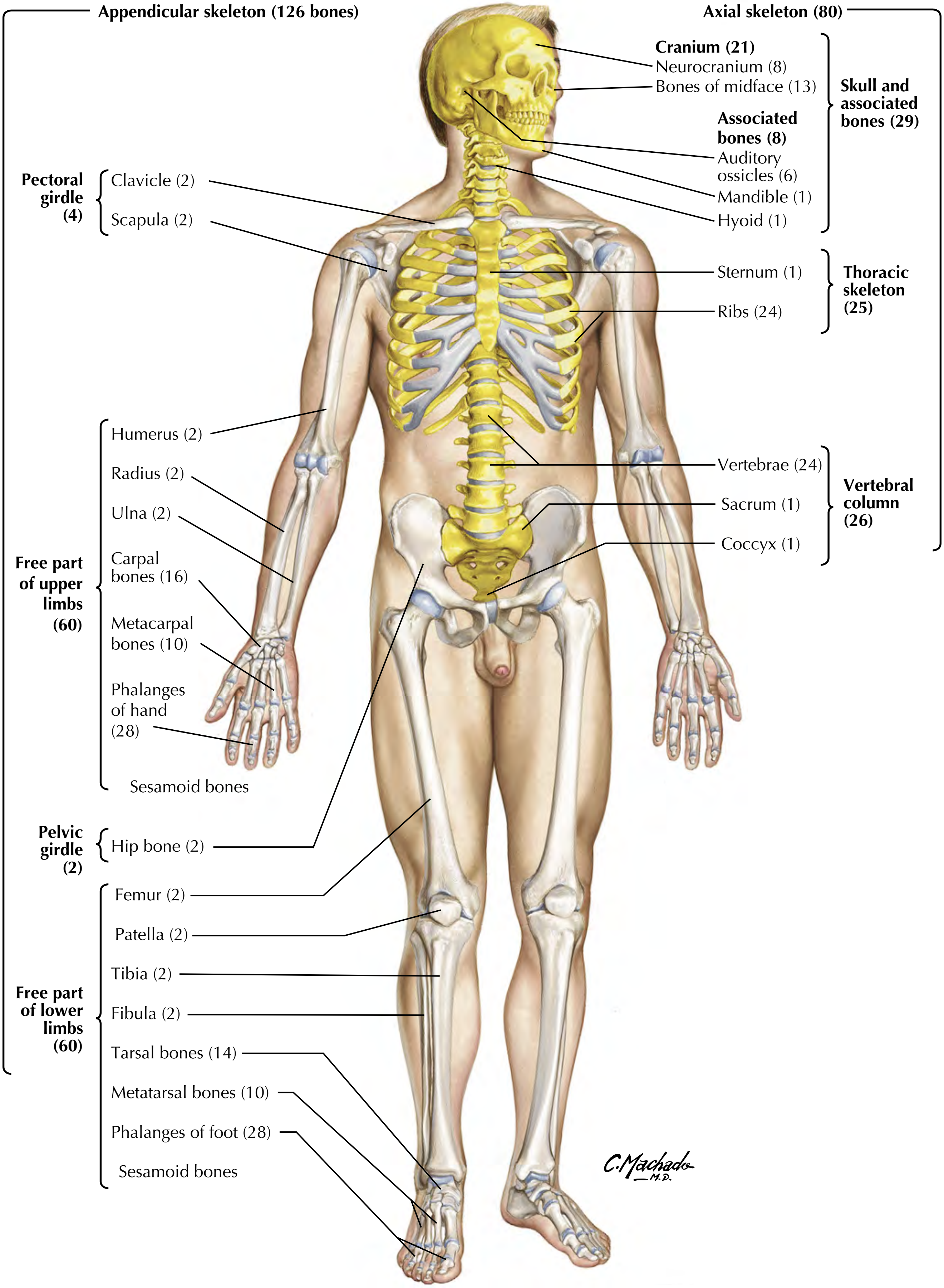
Parasympathetic Nervous System: Schema

See also **Plates 324, 414, BP 7, BP 8**


Ciliary ganglion
Oculomotor n. (CN III)
Facial n. (CN VII)
Medulla oblongata
Glossopharyngeal n. (CN IX)
Lacrimal gland
Eye
Mucous glands of nose, paranasal sinuses, and palate
Pterygopalatine ganglion
Parotid gland
Otic ganglion
Sublingual gland
Submandibular gland
Submandibular ganglion
Larynx
Trachea
Bronchi
Lungs
Vagus n. (CN X)
Heart
Celiac ganglion
Stomach
Liver
Gallbladder
Bile ducts
Superior mesenteric ganglion
Pancreas
Suprarenal gland
Kidney
Intestines
Descending colon
Sigmoid colon
S2
S3
S4
Rectum
Urinary bladder
Pelvic splanchnic nn.
Prostate
C. Machado M.D.
External genitalia
Preganglionic fibers
Postganglionic fibers

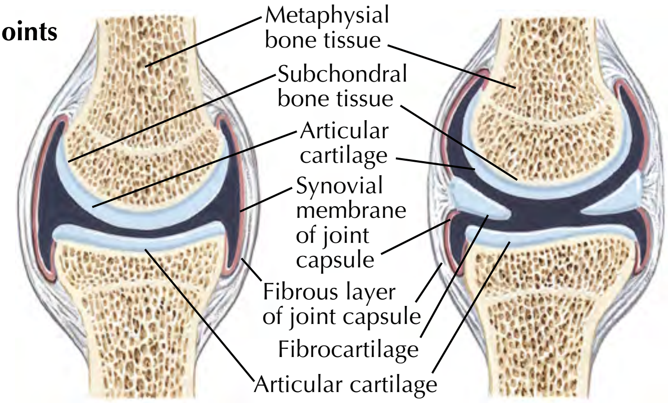
Overview of Skeletal System

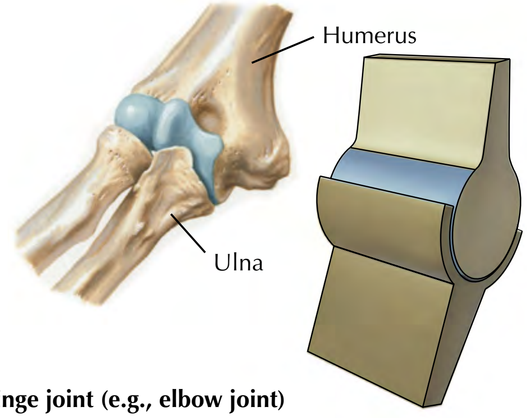
See also **Plate BP 9**


Appendicular skeleton (126 bones)
Axial skeleton (80)
Cranium (21)
Neurocranium (8)
Bones of midface (13)
Skull and associated bones (29)
Associated bones (8)
Auditory ossicles (6)
Mandible (1)
Hyoid (1)
Pectoral girdle (4)
Clavicle (2)
Scapula (2)
Sternum (1)
Ribs (24)
Thoracic skeleton (25)
Humerus (2)
Radius (2)
Ulna (2)
Carpal bones (16)
Metacarpal bones (10)
Phalanges of hand (28)
Sesamoid bones
Free part of upper limbs (60)
Vertebrae (24)
Sacrum (1)
Coccyx (1)
Vertebral column (26)
Pelvic girdle (2)
Hip bone (2)
Femur (2)
Patella (2)
Tibia (2)
Fibula (2)
Tarsal bones (14)
Metatarsal bones (10)
Phalanges of foot (28)
Sesamoid bones
Free part of lower limbs (60)
C. Machado M.D.

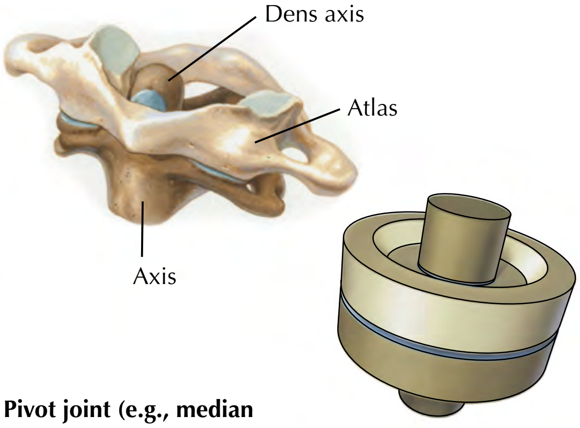
See also **Plate BP 11**

Structure of synovial joints

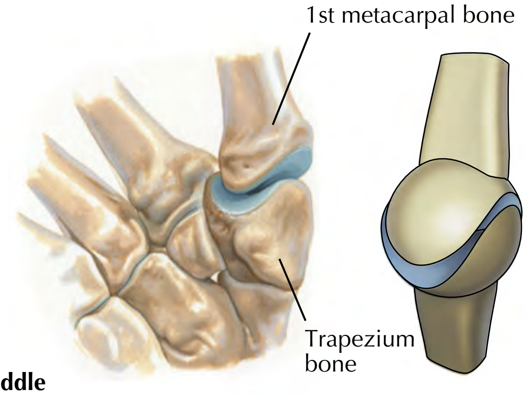

Metaphysial bone tissue
Subchondral bone tissue
Articular cartilage
Synovial membrane of joint capsule
Fibrous layer of joint capsule
Fibrocartilage
Articular cartilage


Humerus
Ulna

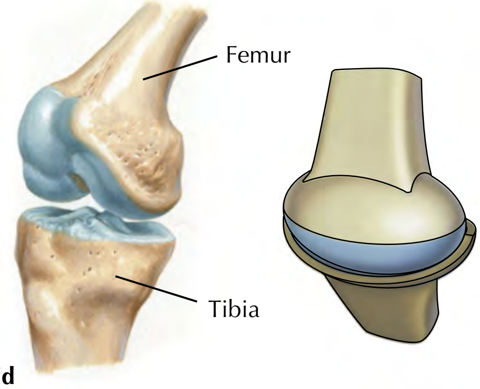
A. Hinge joint (e.g., elbow joint)


Dens axis
Atlas
Axis

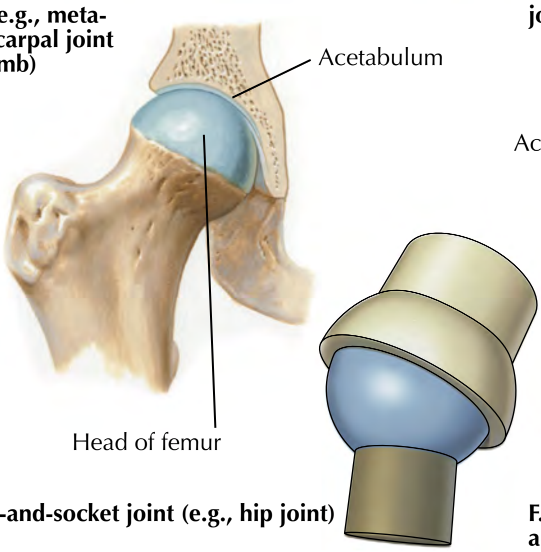
B. Pivot joint (e.g., median atlantoaxial joint)


1st metacarpal bone
Trapezium bone

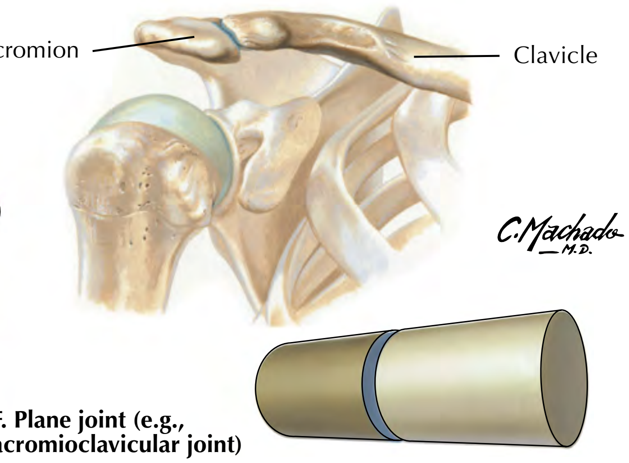
C. Saddle joint (e.g., metacarpocarpal joint of thumb)


Femur
Tibia

D. Condyloid joint (e.g., knee joint)

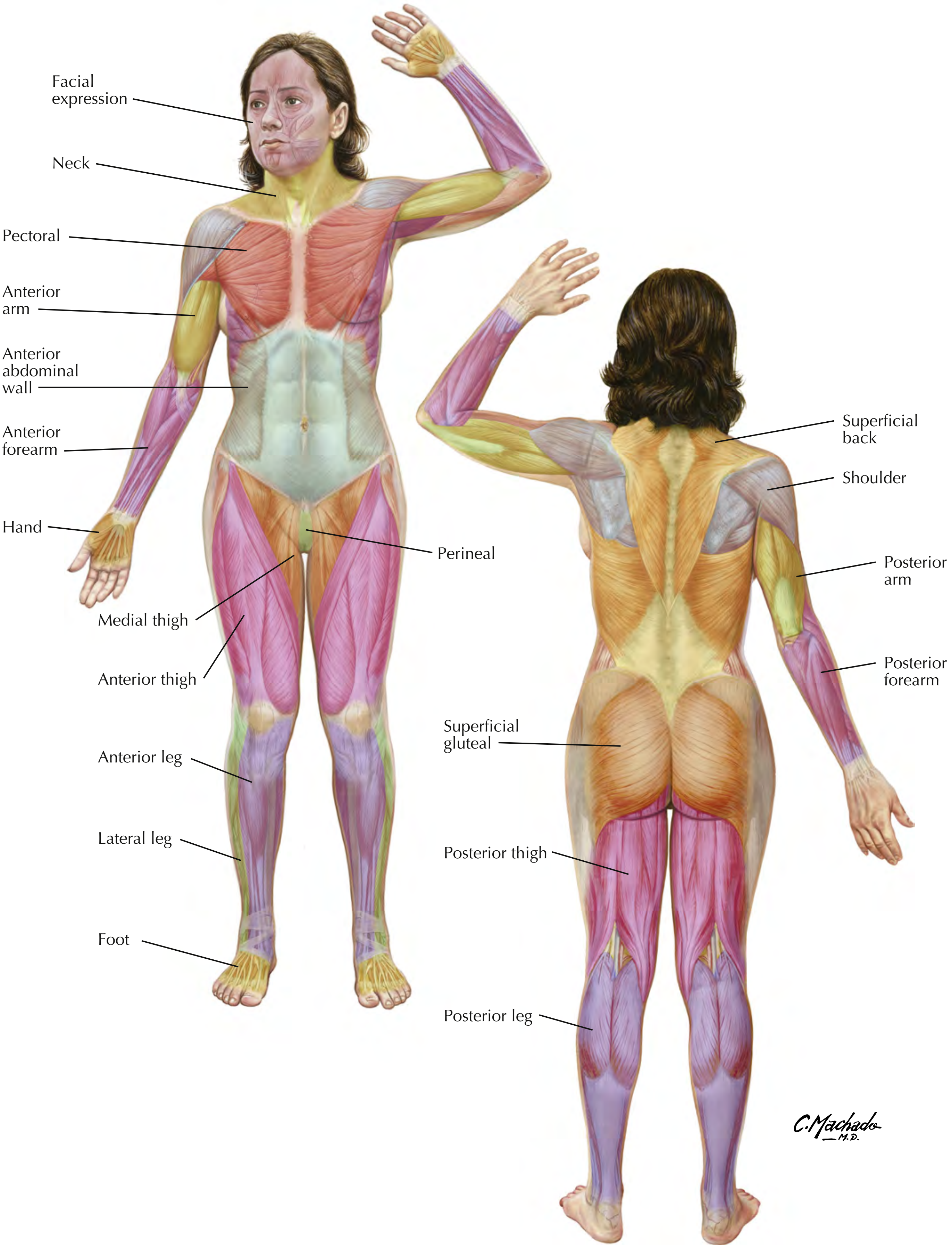

Acetabulum
Head of femur

E. Ball-and-socket joint (e.g., hip joint)

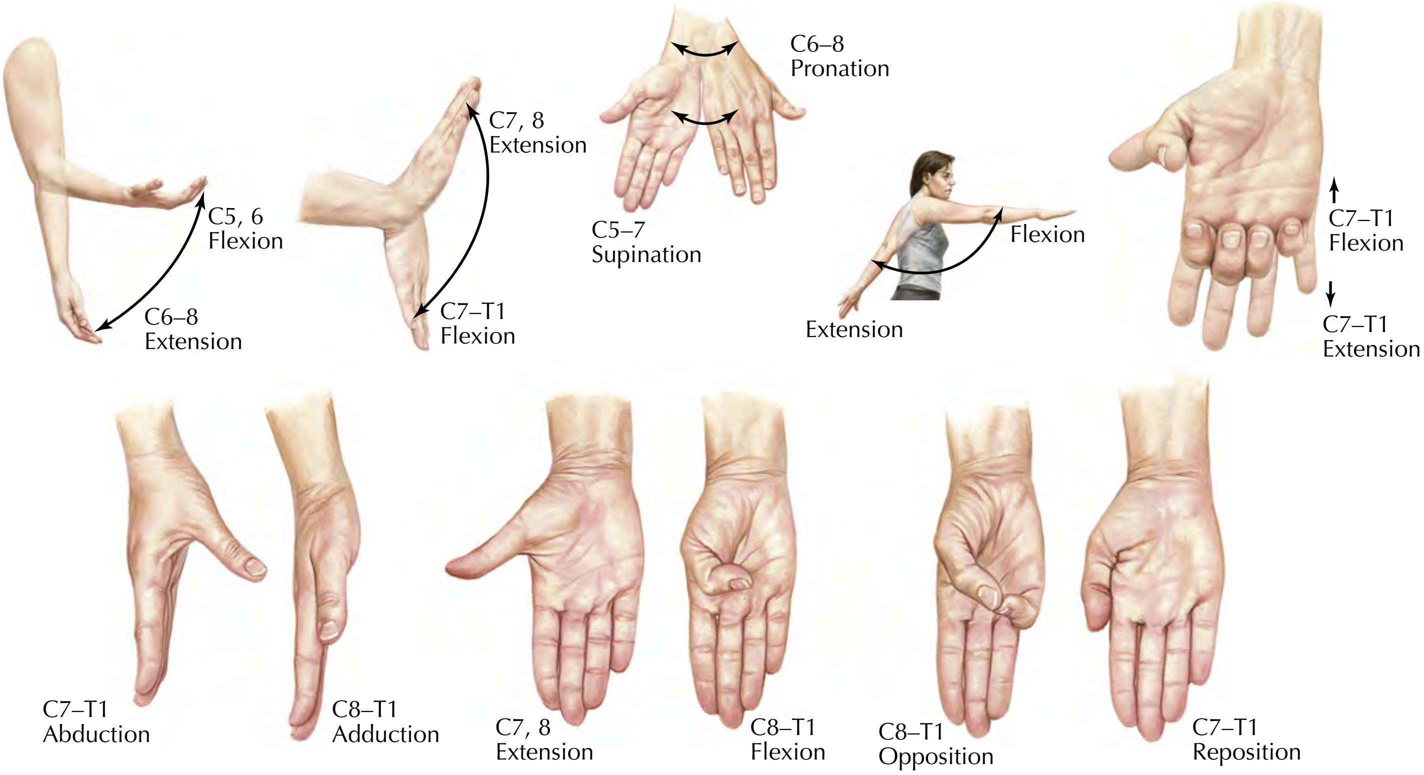

Acromion
Clavicle
C. Machado M.D.

F. Plane joint (e.g., acromioclavicular joint)

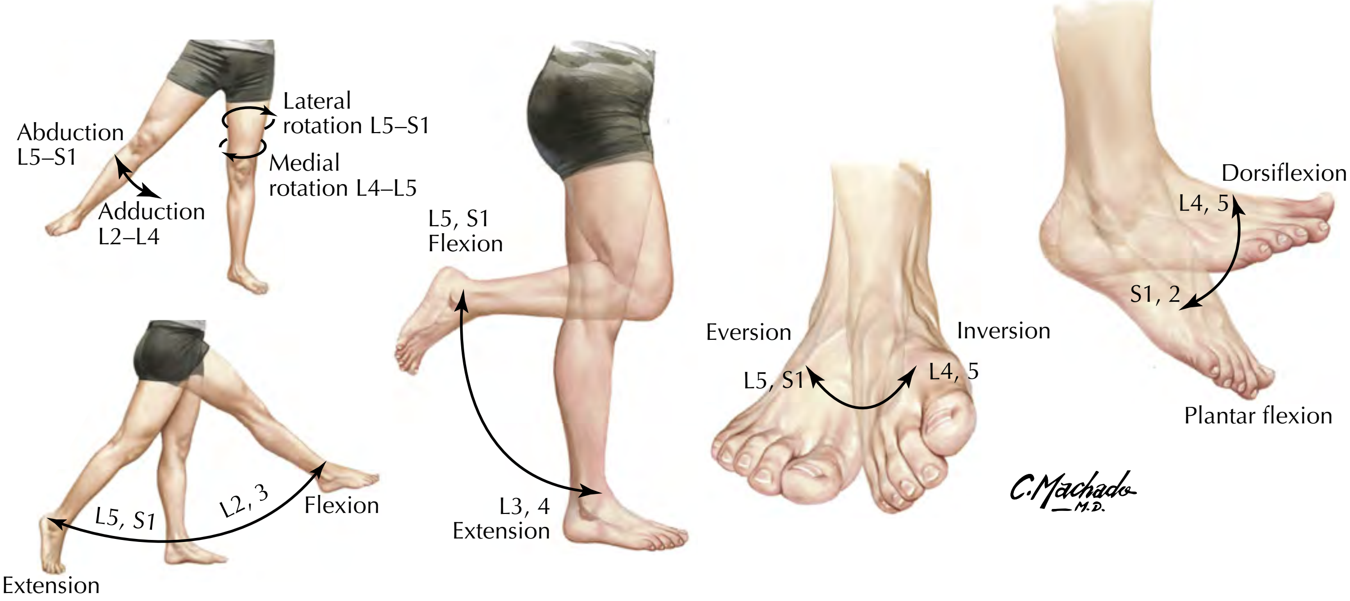
See also **Plate BP 10**


Facial expression
Neck
Pectoral
Anterior arm
Anterior abdominal wall
Anterior forearm
Hand
Perineal
Medial thigh
Anterior thigh
Anterior leg
Lateral leg
Foot
Superficial back
Shoulder
Posterior arm
Posterior forearm
Superficial gluteal
Posterior thigh
Posterior leg
C.Machado M.D.

Segmental innervation of upper limb movements

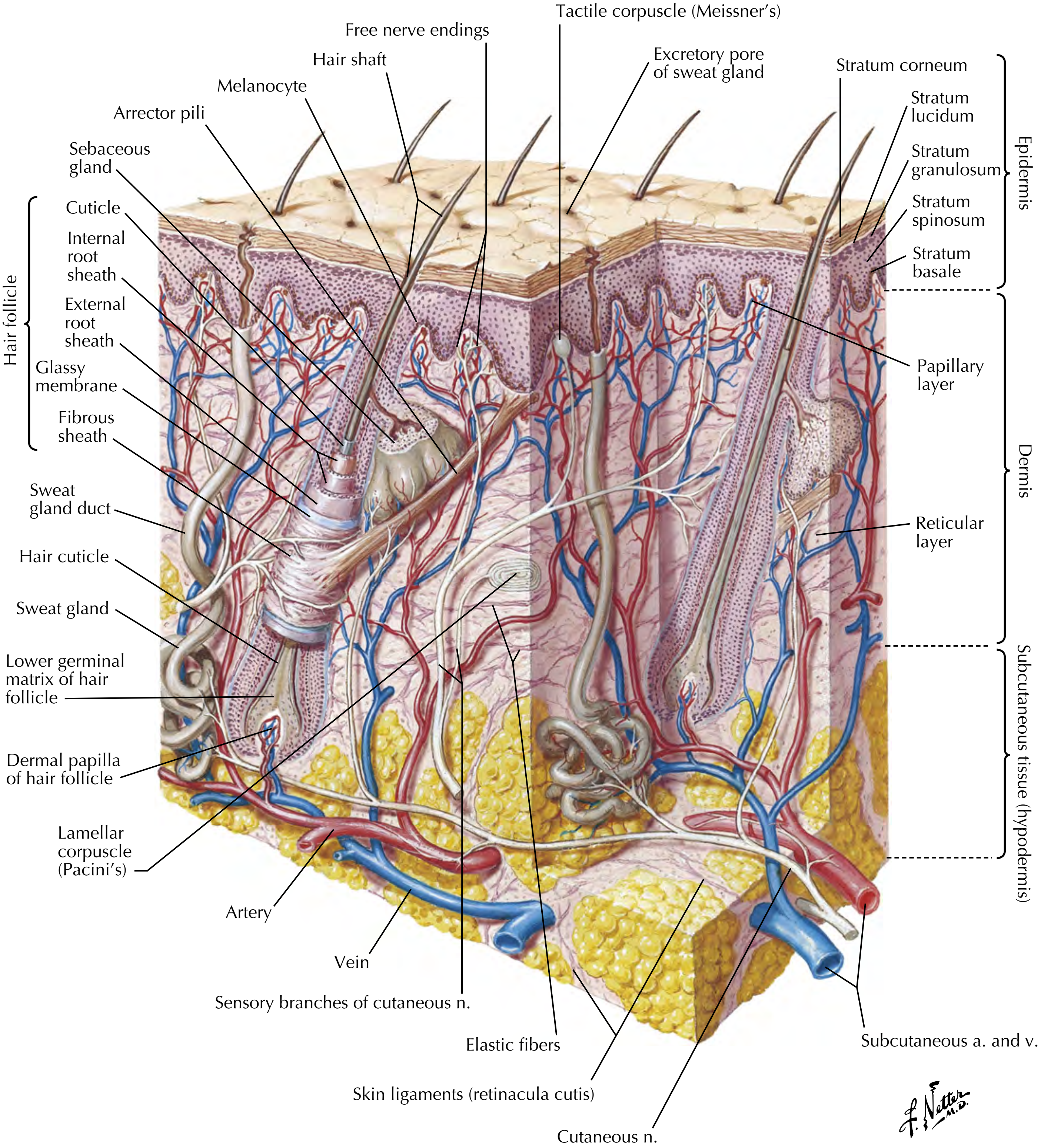

C5, 6
Flexion
C6–8
Extension
C7, 8
Extension
C7–T1
Flexion
C6–8
Pronation
C5–7
Supination
Flexion
Extension
C7–T1
Flexion
C7–T1
Extension
C7–T1
Abduction
C8–T1
Adduction
C7, 8
Extension
C8–T1
Flexion
C8–T1
Opposition
C7–T1
Reposition

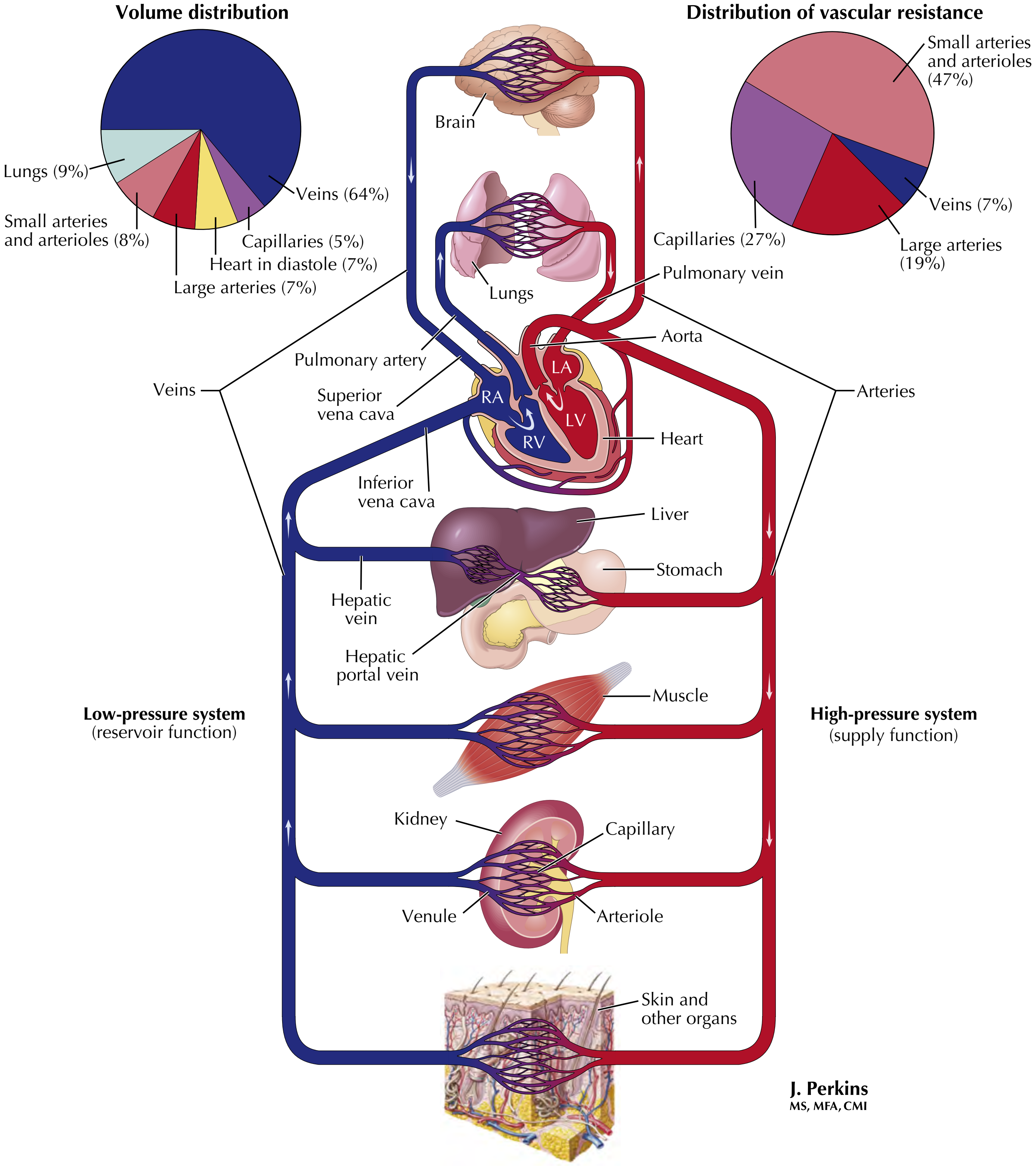
Segmental innervation of lower limb movements


Abduction
L5–S1
Adduction
L2–L4
Lateral
rotation L5–S1
Medial
rotation L4–L5
L5, S1
L2, 3
Flexion
Extension
L5, S1
Flexion
L3, 4
Extension
Eversion
L5, S1
Inversion
L4, 5
Dorsiflexion
L4, 5
S1, 2
Plantar flexion

Cross Section of Skin

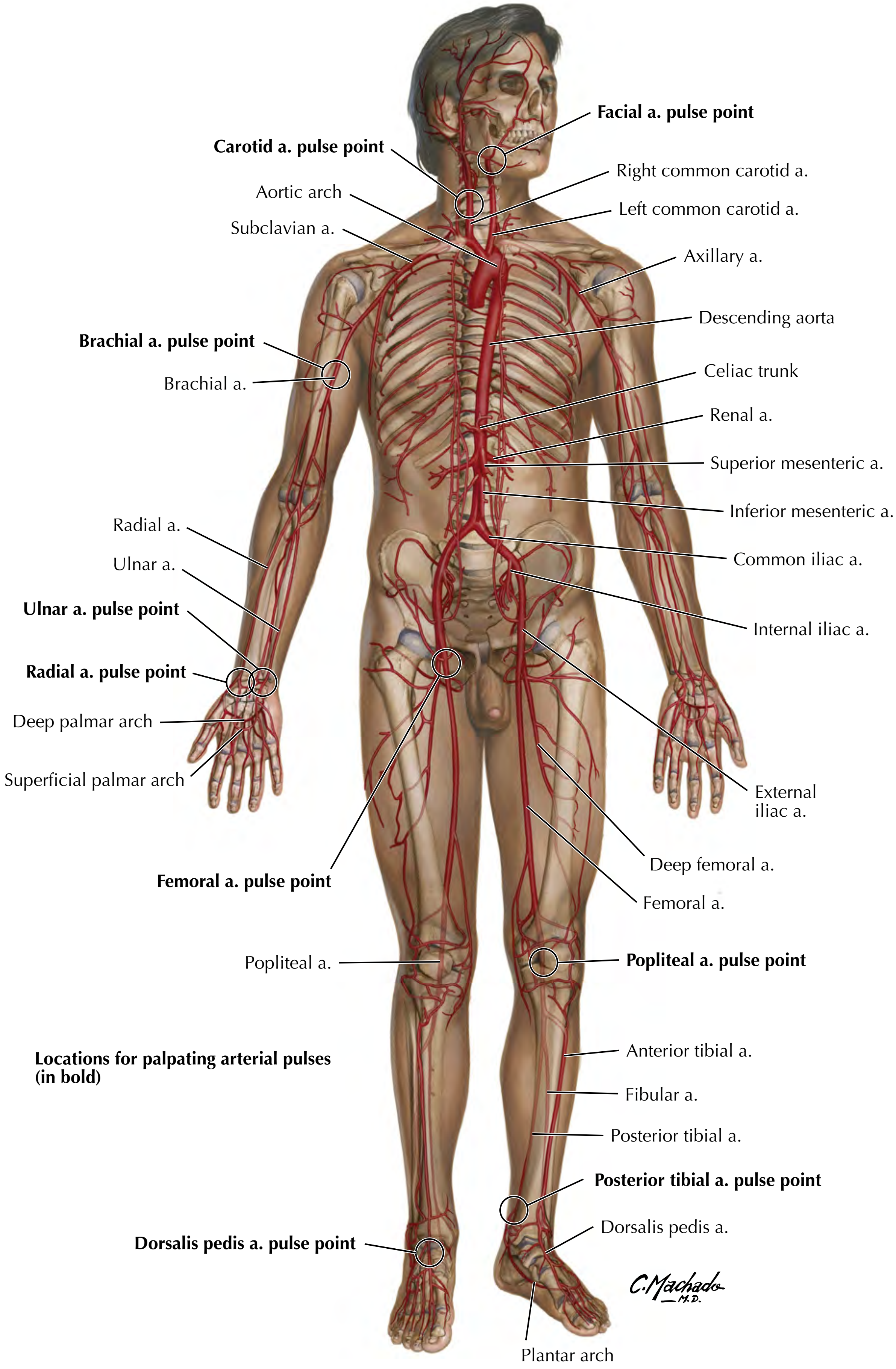
See also **Plate BP 1**


Tactile corpuscle (Meissner's)
Free nerve endings
Hair shaft
Melanocyte
Arrector pili
Sebaceous gland
Excretory pore of sweat gland
Stratum corneum
Stratum lucidum
Stratum granulosum
Stratum spinosum
Stratum basale
Epidermis
Hair follicle
Cuticle
Internal root sheath
External root sheath
Glassy membrane
Fibrous sheath
Papillary layer
Dermis
Sweat gland duct
Reticular layer
Hair cuticle
Sweat gland
Lower germinal matrix of hair follicle
Subcutaneous tissue (hypodermis)
Dermal papilla of hair follicle
Lamellar corpuscle (Pacini's)
Artery
Vein
Sensory branches of cutaneous n.
Elastic fibers
Subcutaneous a. and v.
Skin ligaments (retinacula cutis)
Cutaneous n.

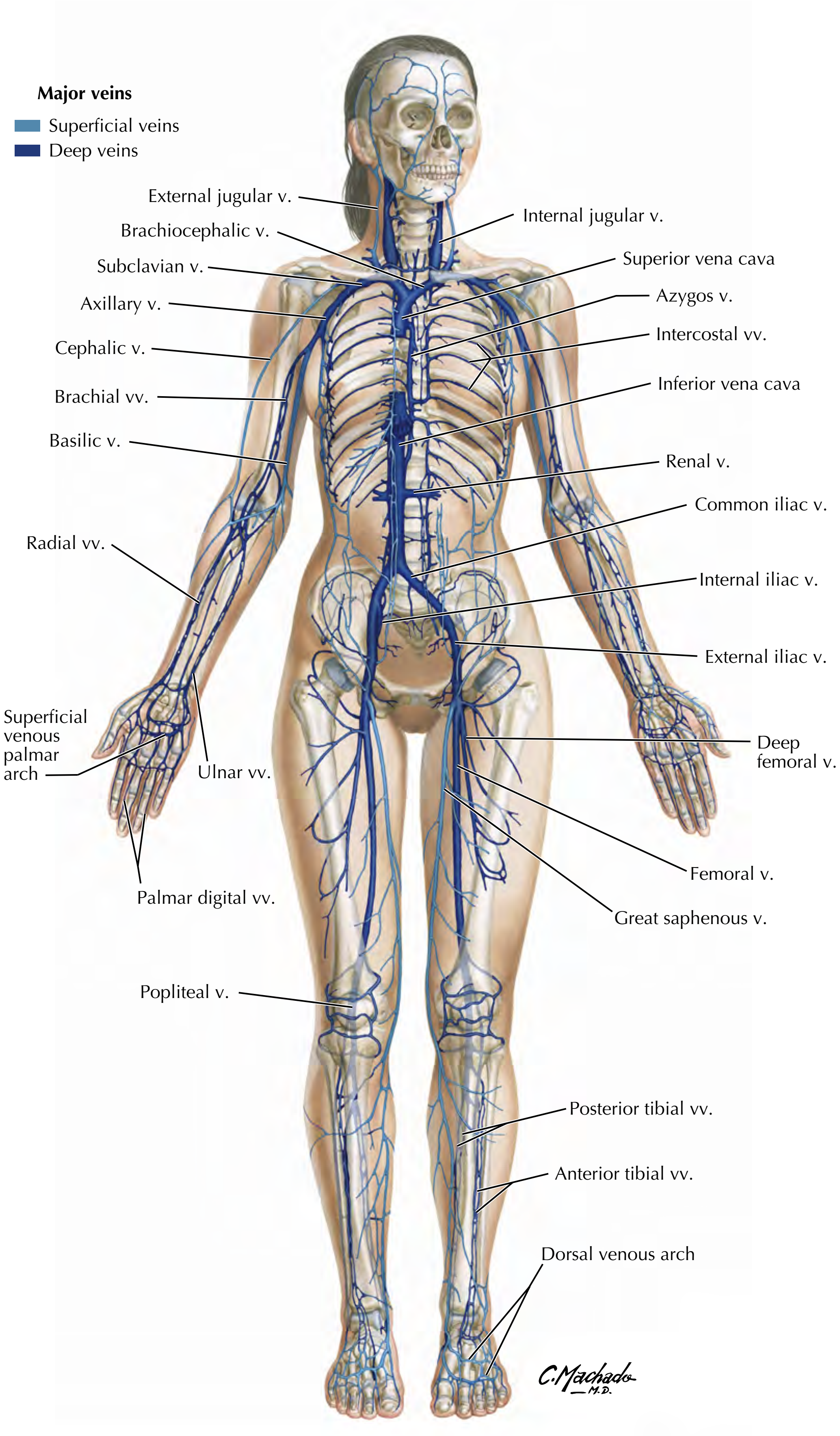

Volume distribution
Lungs (9%)
Small arteries and arterioles (8%)
Large arteries (7%)
Heart in diastole (7%)
Capillaries (5%)
Veins (64%)
Distribution of vascular resistance
Small arteries and arterioles (47%)
Veins (7%)
Large arteries (19%)
Capillaries (27%)
Brain
Lungs
Pulmonary vein
Pulmonary artery
Aorta
Veins
Superior vena cava
LA
RA
LV
RV
Arteries
Heart
Inferior vena cava
Liver
Stomach
Hepatic vein
Hepatic portal vein
Muscle
Low-pressure system
(reservoir function)
High-pressure system
(supply function)
Kidney
Capillary
Venule
Arteriole
Skin and other organs
J. Perkins
MS, MFA, CMI

Major Arteries and Pulse Points

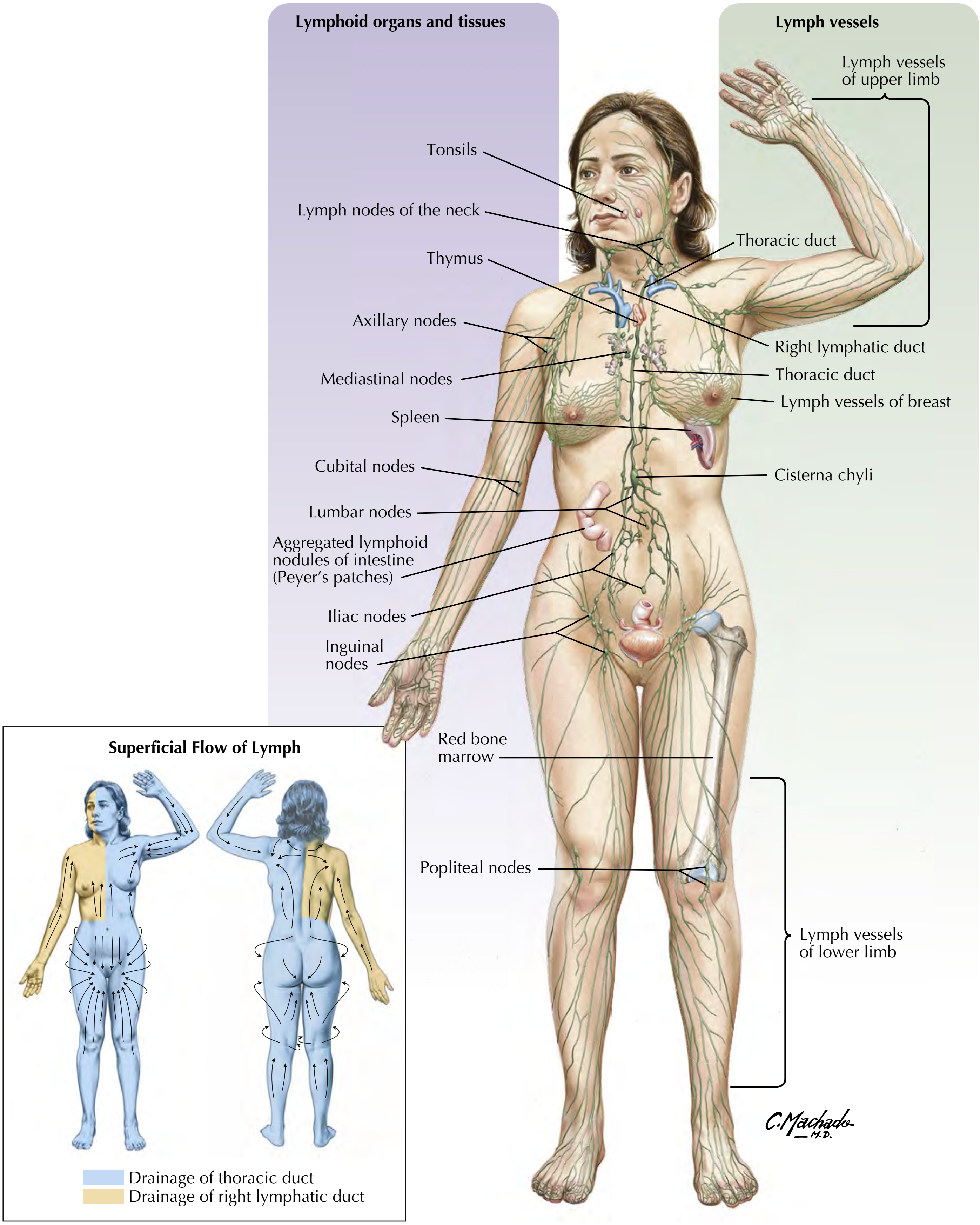
See also **Plate BP 13**

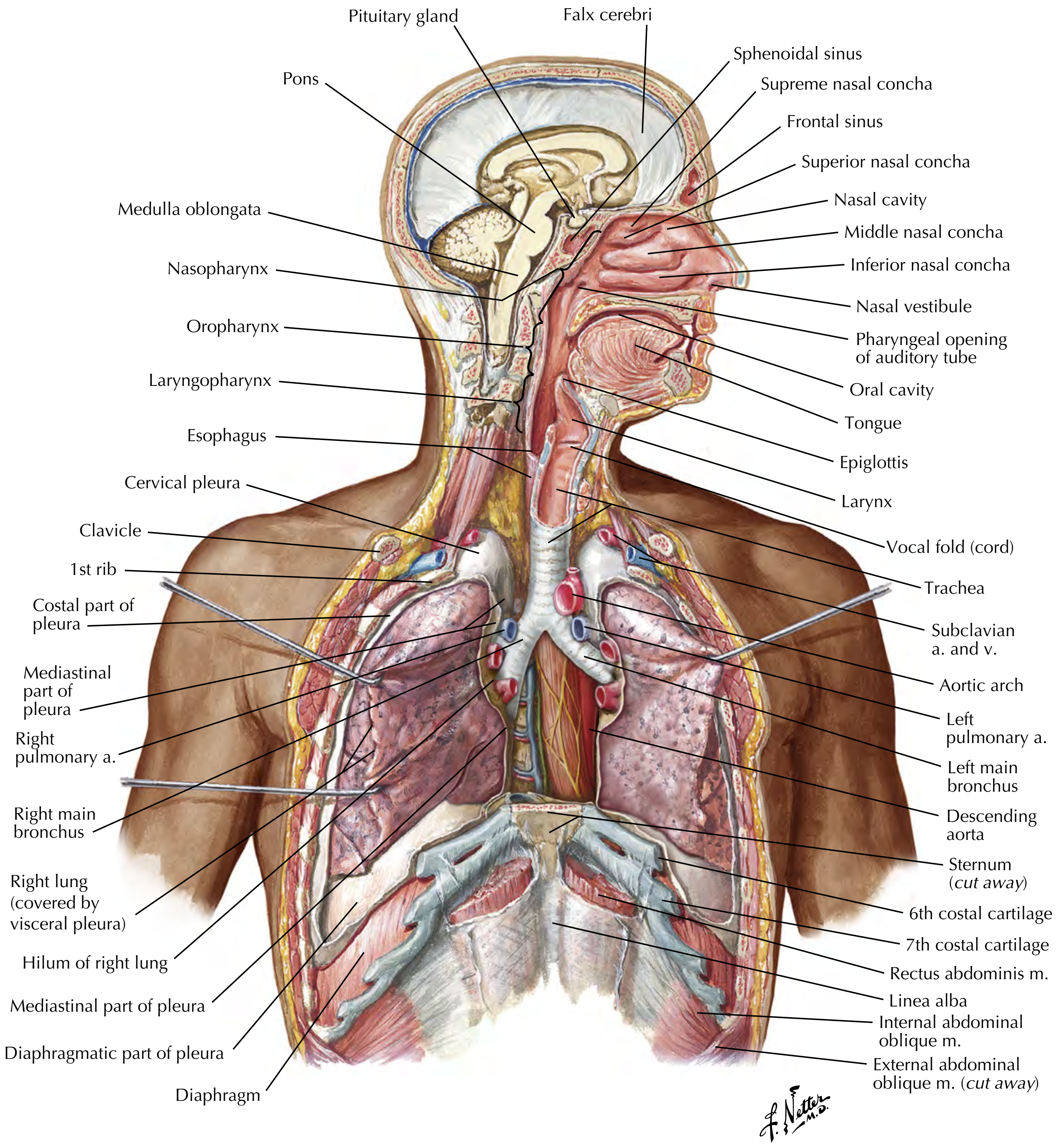

Facial a. pulse point
Carotid a. pulse point
Right common carotid a.
Aortic arch
Left common carotid a.
Subclavian a.
Axillary a.
Descending aorta
Brachial a. pulse point
Brachial a.
Celiac trunk
Renal a.
Superior mesenteric a.
Inferior mesenteric a.
Radial a.
Ulnar a.
Common iliac a.
Ulnar a. pulse point
Internal iliac a.
Radial a. pulse point
Deep palmar arch
Superficial palmar arch
External iliac a.
Deep femoral a.
Femoral a. pulse point
Femoral a.
Popliteal a.
Popliteal a. pulse point
Anterior tibial a.
Fibular a.
Posterior tibial a.
Posterior tibial a. pulse point
Dorsalis pedis a. pulse point
Dorsalis pedis a.
C.Machado M.D.
Plantar arch

Locations for palpating arterial pulses (in bold)

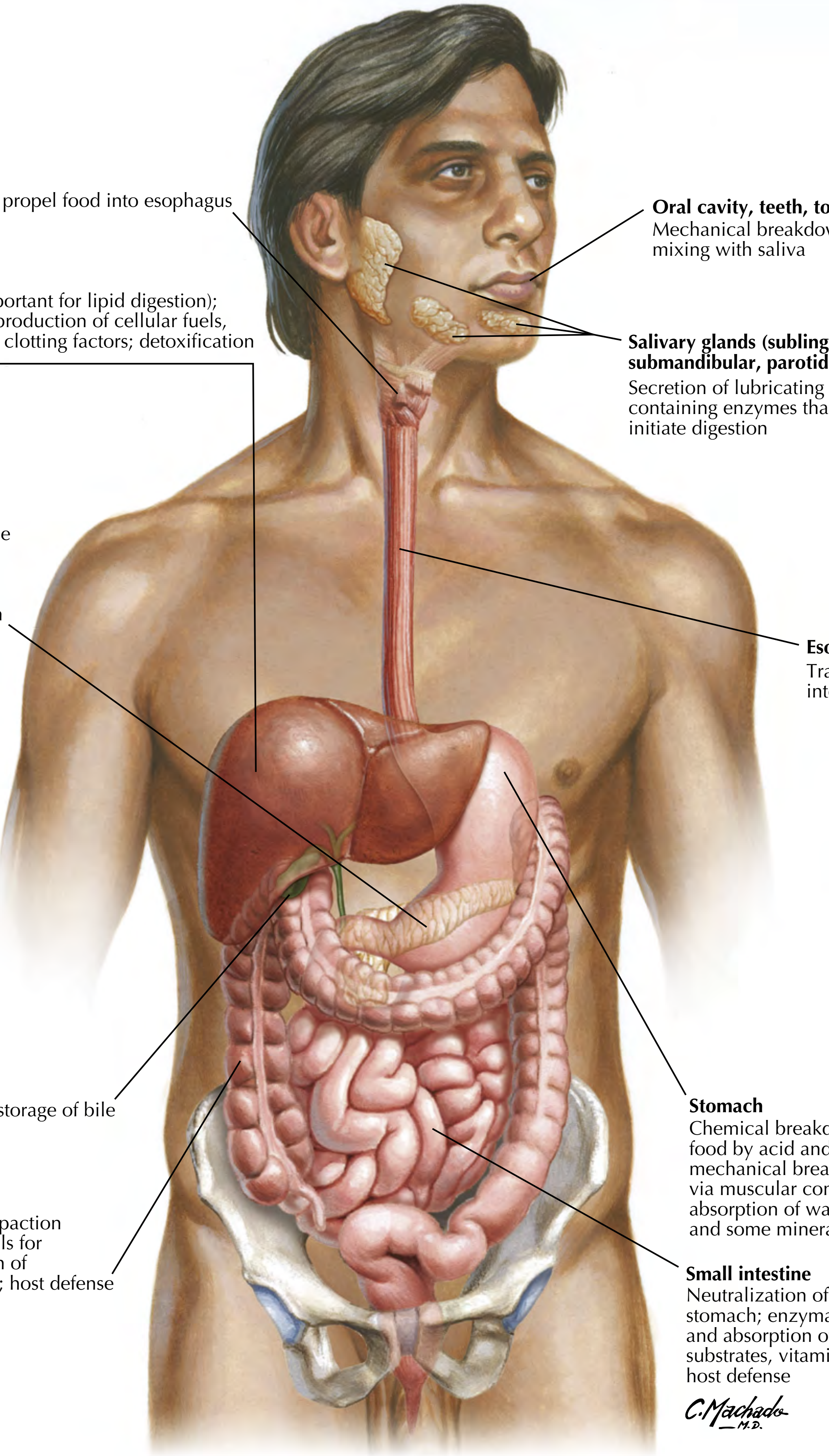

Major veins
🟦 Superficial veins
🟦 Deep veins
External jugular v.
Brachiocephalic v.
Subclavian v.
Axillary v.
Cephalic v.
Brachial vv.
Basilic v.
Radial vv.
Superficial venous palmar arch
Ulnar vv.
Palmar digital vv.
Popliteal v.
Internal jugular v.
Superior vena cava
Azygos v.
Intercostal vv.
Inferior vena cava
Renal v.
Common iliac v.
Internal iliac v.
External iliac v.
Deep femoral v.
Femoral v.
Great saphenous v.
Posterior tibial vv.
Anterior tibial vv.
Dorsal venous arch
C.Machado M.D.

Overview of Lymph Vessels and Lymphoid Organs


Lymphoid organs and tissues
Tonsils
Lymph nodes of the neck
Thymus
Axillary nodes
Mediastinal nodes
Spleen
Cubital nodes
Lumbar nodes
Aggregated lymphoid nodules of intestine (Peyer's patches)
Iliac nodes
Inguinal nodes
Red bone marrow
Popliteal nodes
Lymph vessels
Lymph vessels of upper limb
Thoracic duct
Right lymphatic duct
Thoracic duct
Lymph vessels of breast
Cisterna chyli
Lymph vessels of lower limb
C. Machado M.D.
Superficial Flow of Lymph
🟦 Drainage of thoracic duct
🟨 Drainage of right lymphatic duct


Pituitary gland
Falx cerebri
Pons
Sphenoidal sinus
Supreme nasal concha
Frontal sinus
Superior nasal concha
Medulla oblongata
Nasal cavity
Middle nasal concha
Nasopharynx
Inferior nasal concha
Nasal vestibule
Oropharynx
Pharyngeal opening of auditory tube
Oral cavity
Laryngopharynx
Tongue
Esophagus
Epiglottis
Larynx
Cervical pleura
Vocal fold (cord)
Clavicle
Trachea
1st rib
Costal part of pleura
Subclavian a. and v.
Mediastinal part of pleura
Aortic arch
Right pulmonary a.
Left pulmonary a.
Left main bronchus
Right main bronchus
Descending aorta
Sternum (*cut away*)
Right lung (covered by visceral pleura)
6th costal cartilage
7th costal cartilage
Hilum of right lung
Rectus abdominis m.
Linea alba
Mediastinal part of pleura
Internal abdominal oblique m.
Diaphragmatic part of pleura
External abdominal oblique m. (*cut away*)
Diaphragm

Overview of Digestive System



Pharynx
Pharyngeal muscles propel food into esophagus

Liver
Secretion of bile (important for lipid digestion); storage of nutrients; production of cellular fuels, plasma proteins, and clotting factors; detoxification and phagocytosis

Pancreas
Secretion of buffers and digestive enzymes by exocrine cells; secretion of hormones by endocrine cells to regulate digestion

Gallbladder
Concentration and storage of bile

Large intestine
Dehydration and compaction of indigestible materials for elimination; resorption of water and electrolytes; host defense

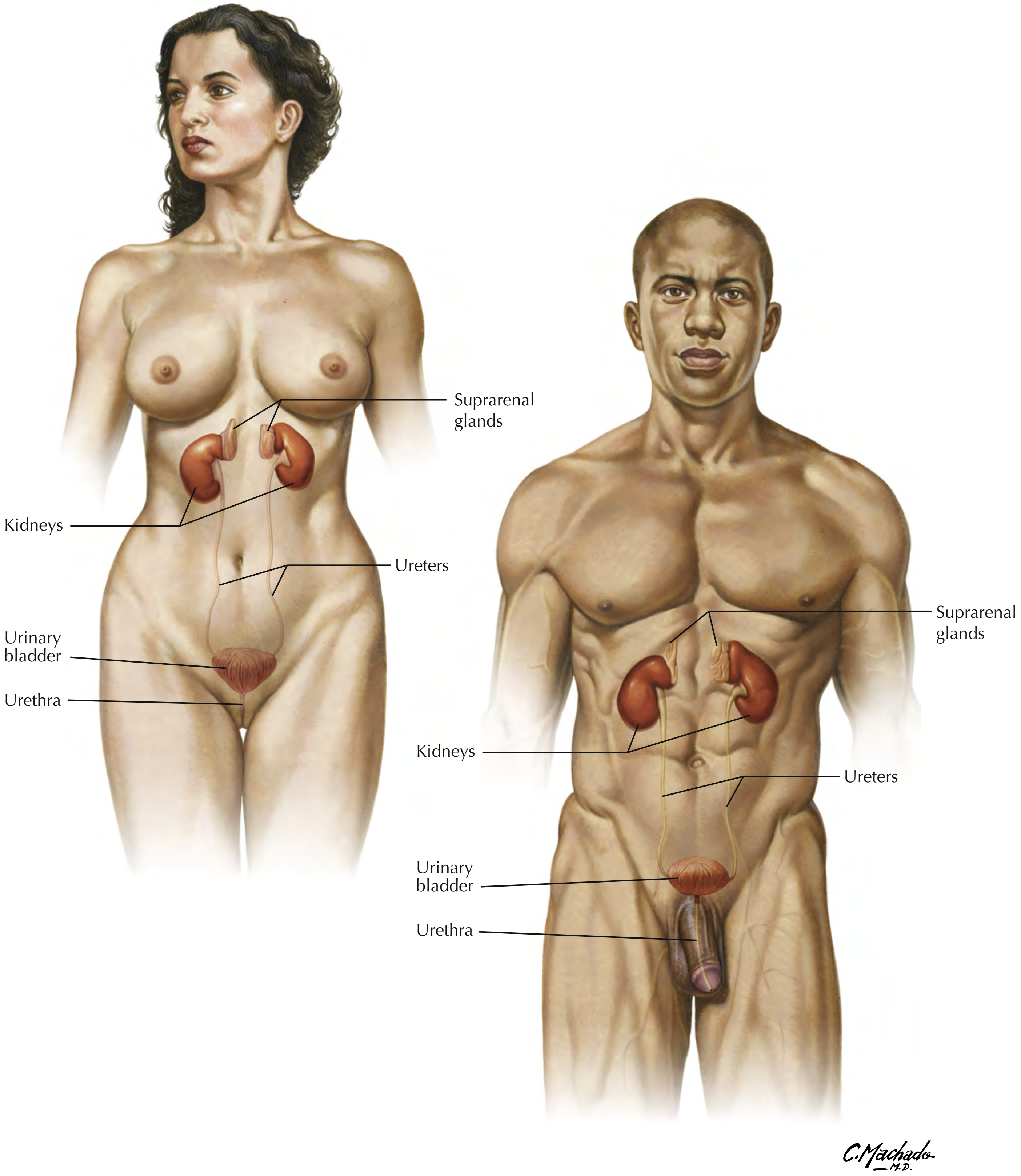
Oral cavity, teeth, tongue
Mechanical breakdown, mixing with saliva

Salivary glands (sublingual, submandibular, parotid)
Secretion of lubricating fluid containing enzymes that initiate digestion

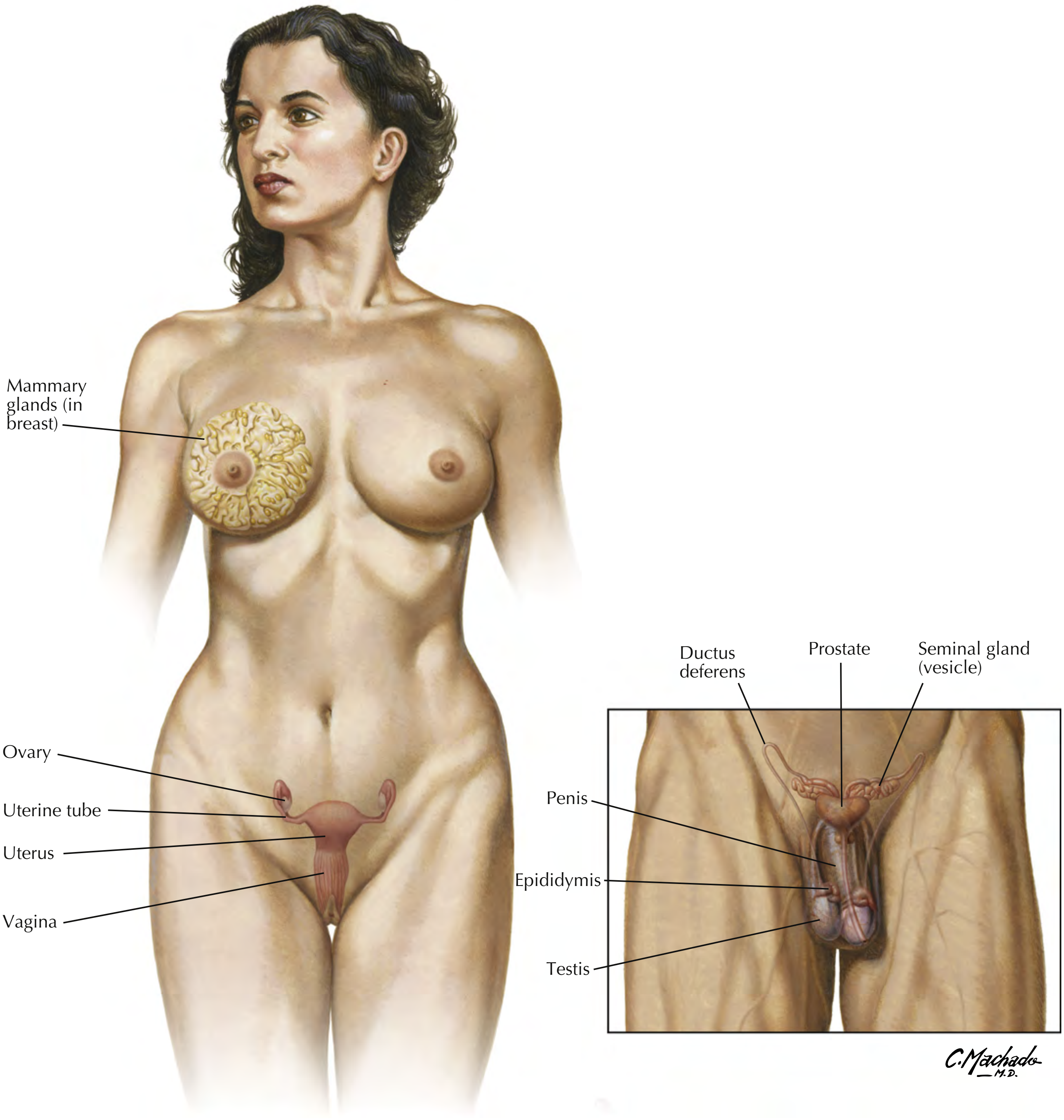
Esophagus
Transport of food into the stomach

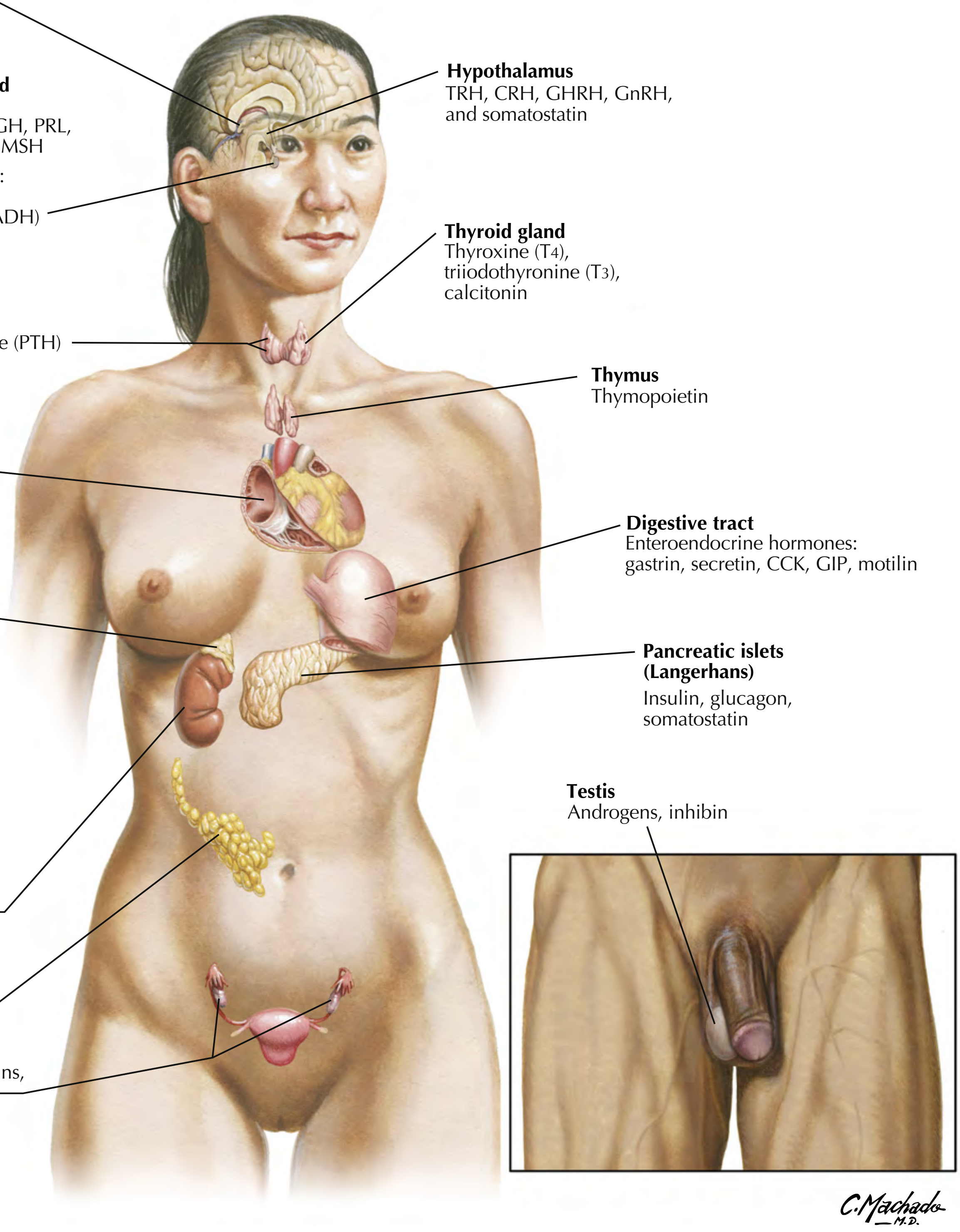
Stomach
Chemical breakdown of food by acid and enzymes; mechanical breakdown via muscular contractions; absorption of water, alcohol, and some minerals

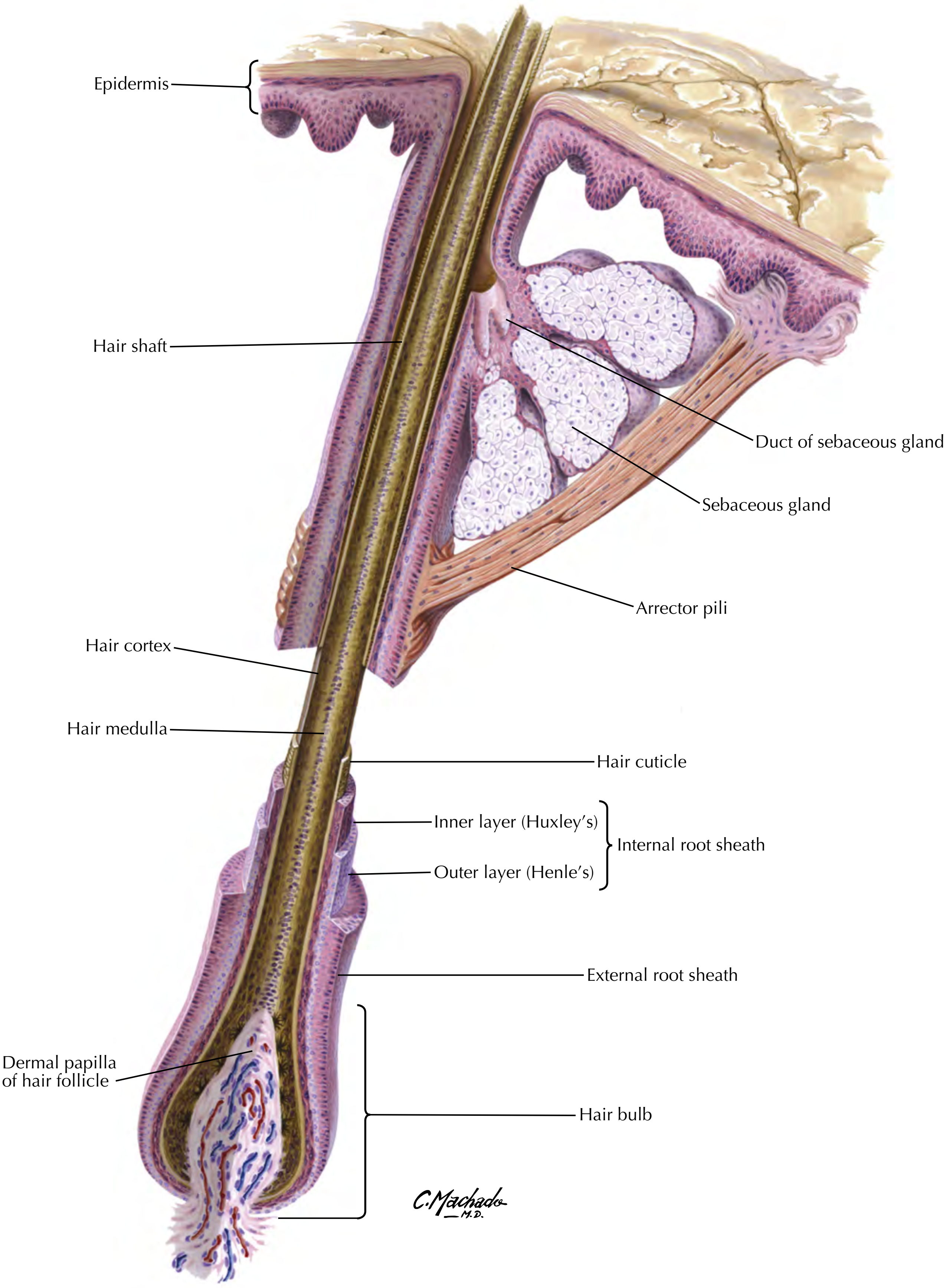
Small intestine
Neutralization of acid from stomach; enzymatic digestion and absorption of water, organic substrates, vitamins, and ions; host defense

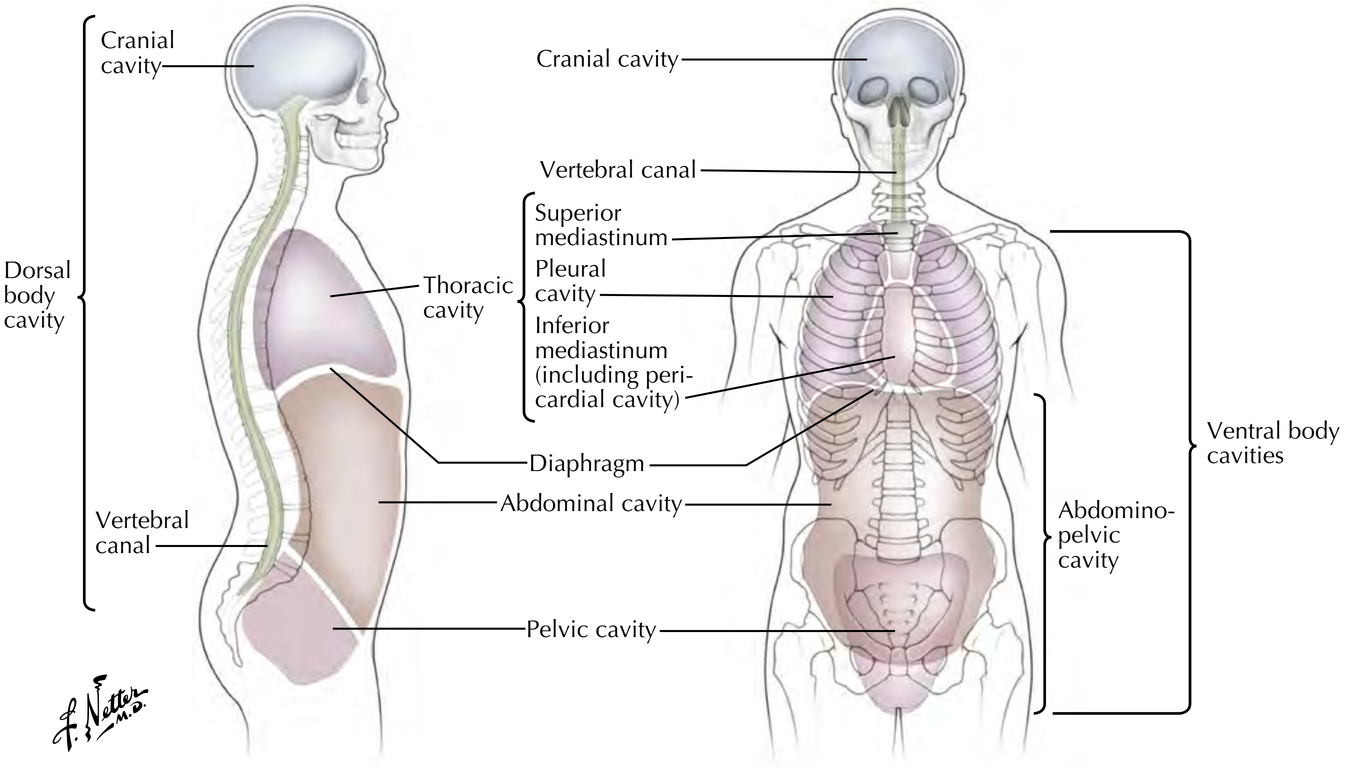

Suprarenal glands
Kidneys
Ureters
Urinary bladder
Urethra
Suprarenal glands
Kidneys
Ureters
Urinary bladder
Urethra
C. Machado M.D.

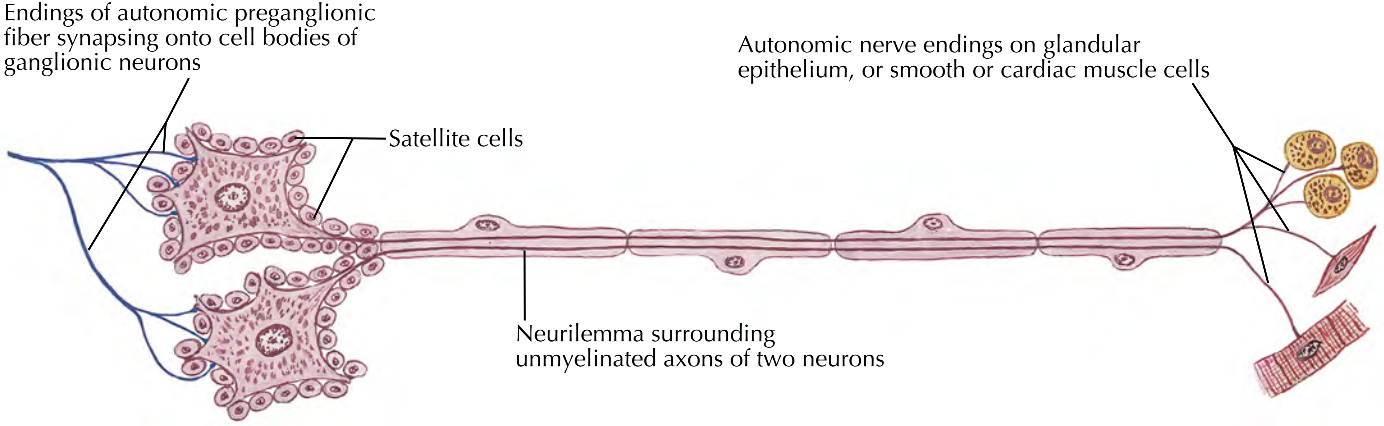
Overview of Reproductive System


Mammary glands (in breast)
Ovary
Uterine tube
Uterus
Vagina
Ductus deferens
Prostate
Seminal gland (vesicle)
Penis
Epididymis
Testis

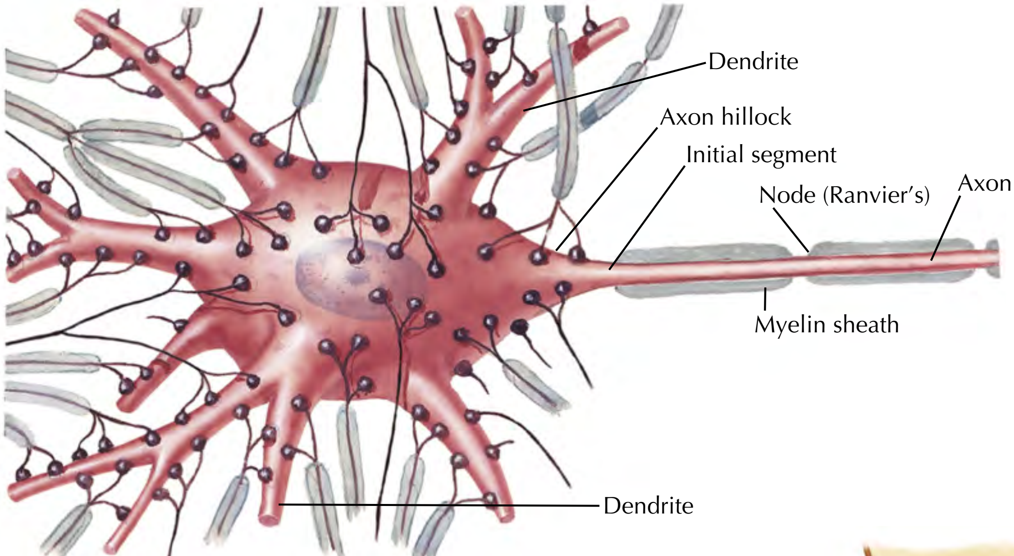

Pineal gland
Melatonin
Pituitary gland
Anterior lobe:
ACTH, TSH, GH, PRL,
FSH, LH, and MSH
Posterior lobe:
Oxytocin and
vasopressin (ADH)
Hypothalamus
TRH, CRH, GHRH, GnRH,
and somatostatin
Thyroid gland
Thyroxine (T4),
triiodothyronine (T3),
calcitonin
Parathyroid glands
Parathyroid hormone (PTH)
Thymus
Thymopoietin
Heart
Atrial natriuretic
peptide (ANP)
Digestive tract
Enteroendocrine hormones:
gastrin, secretin, CCK, GIP, motilin
Suprarenal gland
Medulla:
epinephrine,
norepinephrine
Cortex:
mineral corticoids
glucocorticoids,
androgens
Pancreatic islets
(Langerhans)
Insulin, glucagon,
somatostatin
Testis
Androgens, inhibin
Kidney
Erythropoietin
(EPO), calcitriol,
renin
Adipose tissue
Leptin
Ovaries
Estrogens, progestins,
inhibin, relaxin
C. Machado
M.D.


Epidermis
Hair shaft
Duct of sebaceous gland
Sebaceous gland
Arrector pili
Hair cortex
Hair medulla
Hair cuticle
Inner layer (Huxley's)
Outer layer (Henle's)
Internal root sheath
External root sheath
Dermal papilla of hair follicle
Hair bulb
C.Machado M.D.


Cranial cavity
Dorsal body cavity
Thoracic cavity
Vertebral canal
Cranial cavity
Vertebral canal
Superior mediastinum
Pleural cavity
Inferior mediastinum (including pericardial cavity)
Diaphragm
Abdominal cavity
Pelvic cavity
Ventral body cavities
Abdomino-pelvic cavity

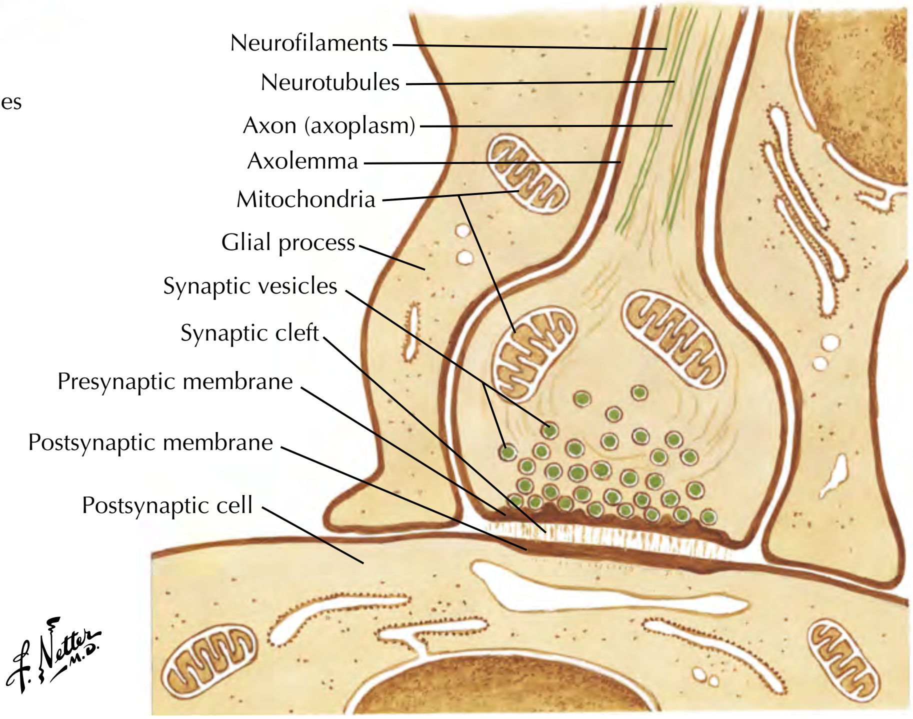

Endings of autonomic preganglionic fiber synapsing onto cell bodies of ganglionic neurons
Satellite cells
Autonomic nerve endings on glandular epithelium, or smooth or cardiac muscle cells
Neurilemma surrounding unmyelinated axons of two neurons

Two postganglionic autonomic neurons of a sympathetic or parasympathetic ganglion


Dendrite
Axon hillock
Initial segment
Node (Ranvier's)
Axon
Myelin sheath
Dendrite

Schematic of synapses on neuron

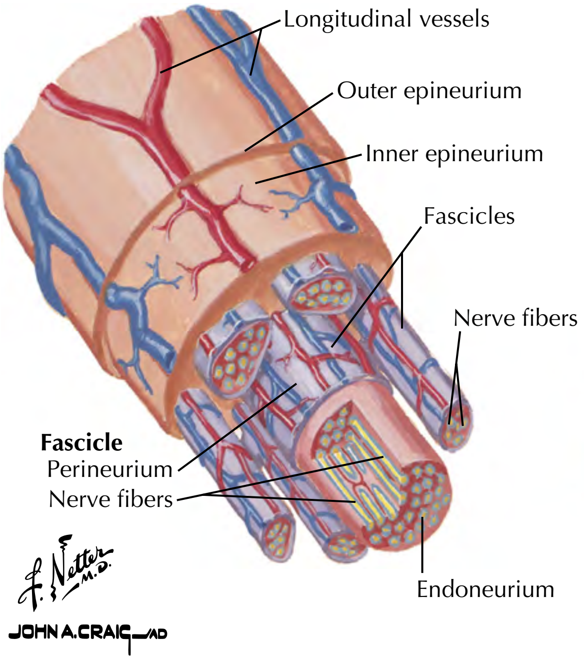
Numerous terminal boutons forming synapses on body and dendrites of a motor neuron

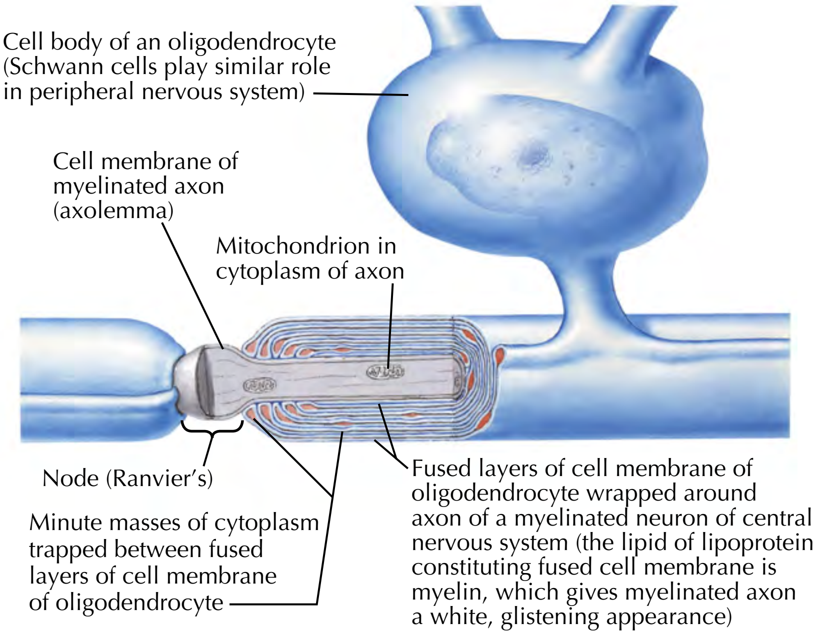

Neurofilaments
Neurotubules
Axon (axoplasm)
Axolemma
Mitochondria
Glial process
Synaptic vesicles
Synaptic cleft
Presynaptic membrane
Postsynaptic membrane
Postsynaptic cell

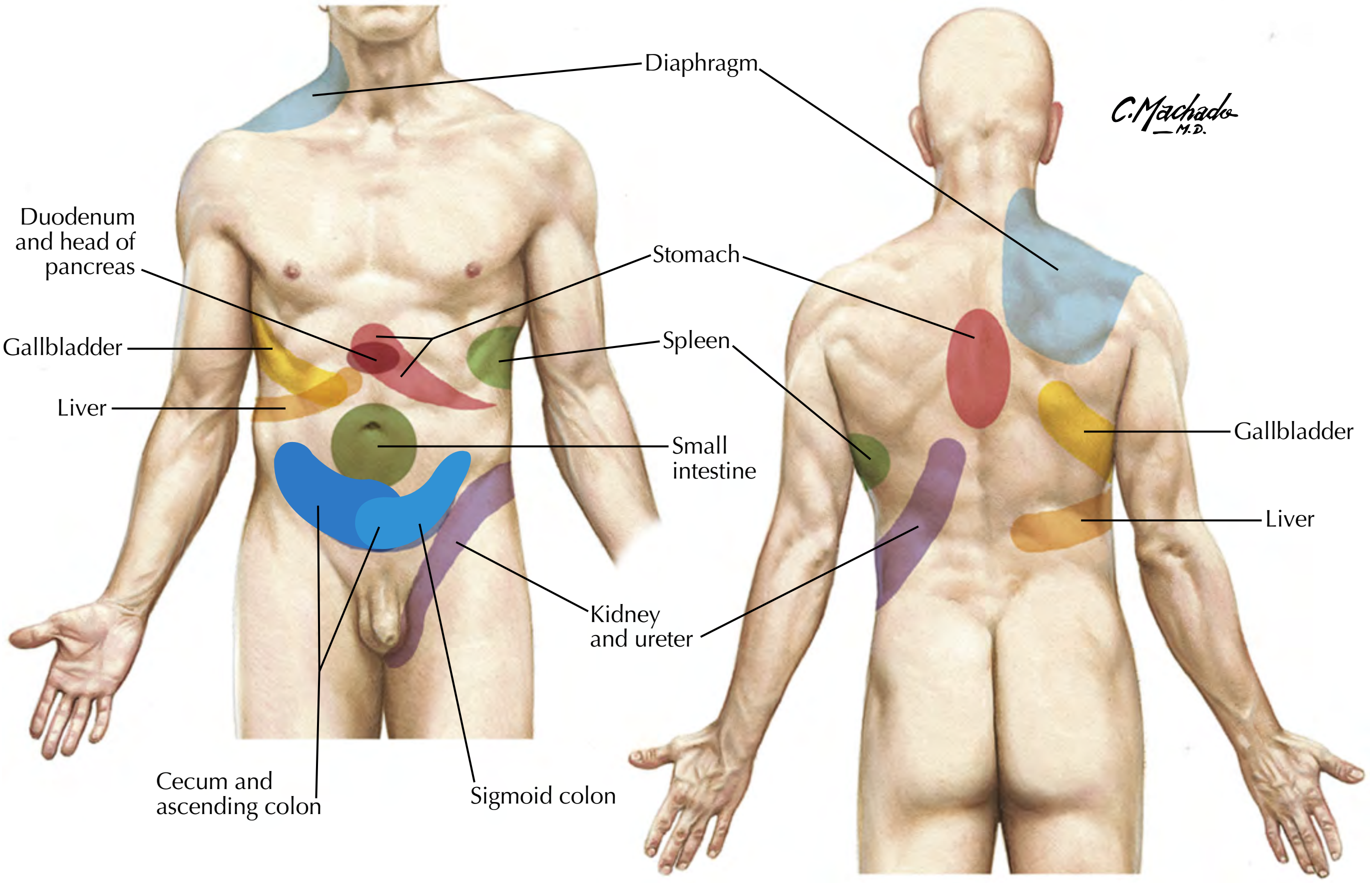
Enlarged section of bouton

Features of a Typical Peripheral Nerve

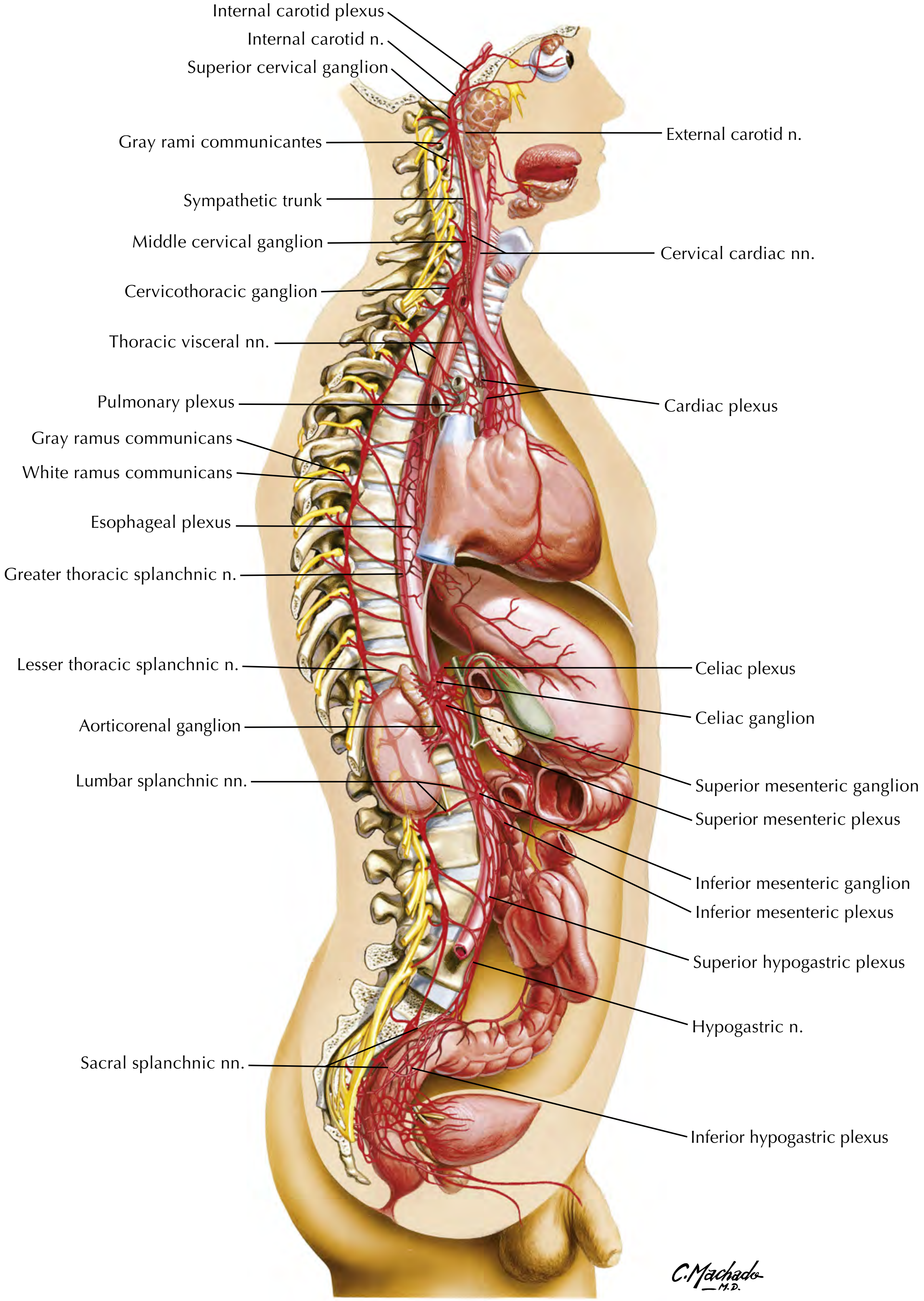
See also **Plate BP 3**


Longitudinal vessels
Outer epineurium
Inner epineurium
Fascicles
Nerve fibers
Fascicle
Perineurium
Nerve fibers
Endoneurium
JOHN A.CRAIG—AD

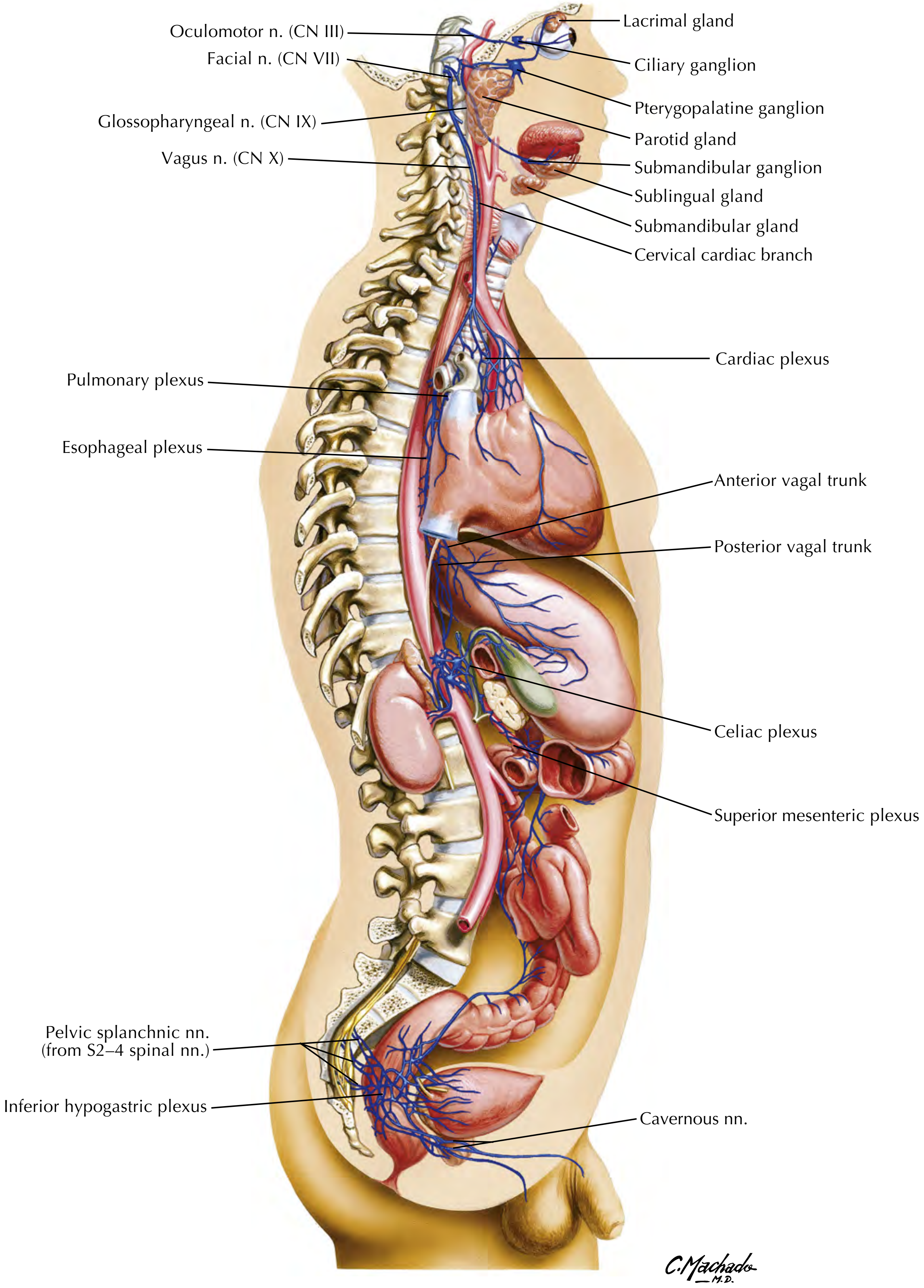

Cell body of an oligodendrocyte (Schwann cells play similar role in peripheral nervous system)
Cell membrane of myelinated axon (axolemma)
Mitochondrion in cytoplasm of axon
Node (Ranvier's)
Minute masses of cytoplasm trapped between fused layers of cell membrane of oligodendrocyte
Fused layers of cell membrane of oligodendrocyte wrapped around axon of a myelinated neuron of central nervous system (the lipid of lipoprotein constituting fused cell membrane is myelin, which gives myelinated axon a white, glistening appearance)


Diaphragm
C. Machado M.D.
Duodenum and head of pancreas
Stomach
Gallbladder
Spleen
Liver
Small intestine
Gallbladder
Liver
Kidney and ureter
Cecum and ascending colon
Sigmoid colon

Sympathetic Nervous System: General Topography


Internal carotid plexus
Internal carotid n.
Superior cervical ganglion
Gray rami communicantes
Sympathetic trunk
Middle cervical ganglion
Cervicothoracic ganglion
Thoracic visceral nn.
Pulmonary plexus
Gray ramus communicans
White ramus communicans
Esophageal plexus
Greater thoracic splanchnic n.
Lesser thoracic splanchnic n.
Aorticorenal ganglion
Lumbar splanchnic nn.
Sacral splanchnic nn.
External carotid n.
Cervical cardiac nn.
Cardiac plexus
Celiac plexus
Celiac ganglion
Superior mesenteric ganglion
Superior mesenteric plexus
Inferior mesenteric ganglion
Inferior mesenteric plexus
Superior hypogastric plexus
Hypogastric n.
Inferior hypogastric plexus
C. Machado M.D.

Parasympathetic Nervous System: General Topography


Oculomotor n. (CN III)
Facial n. (CN VII)
Glossopharyngeal n. (CN IX)
Vagus n. (CN X)
Lacrimal gland
Ciliary ganglion
Pterygopalatine ganglion
Parotid gland
Submandibular ganglion
Sublingual gland
Submandibular gland
Cervical cardiac branch
Cardiac plexus
Pulmonary plexus
Esophageal plexus
Anterior vagal trunk
Posterior vagal trunk
Celiac plexus
Superior mesenteric plexus
Pelvic splanchnic nn. (from S2–4 spinal nn.)
Inferior hypogastric plexus
Cavernous nn.
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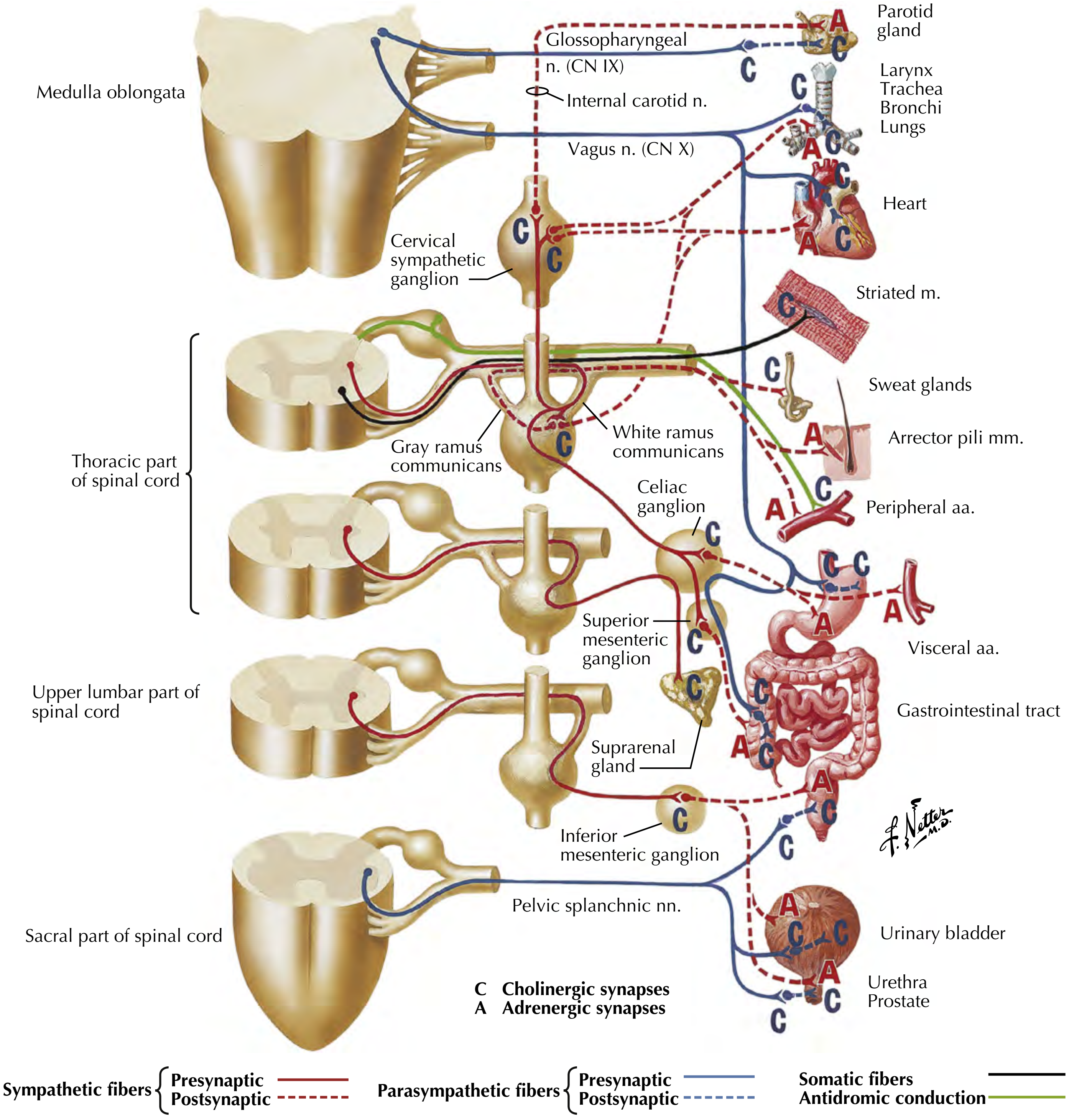
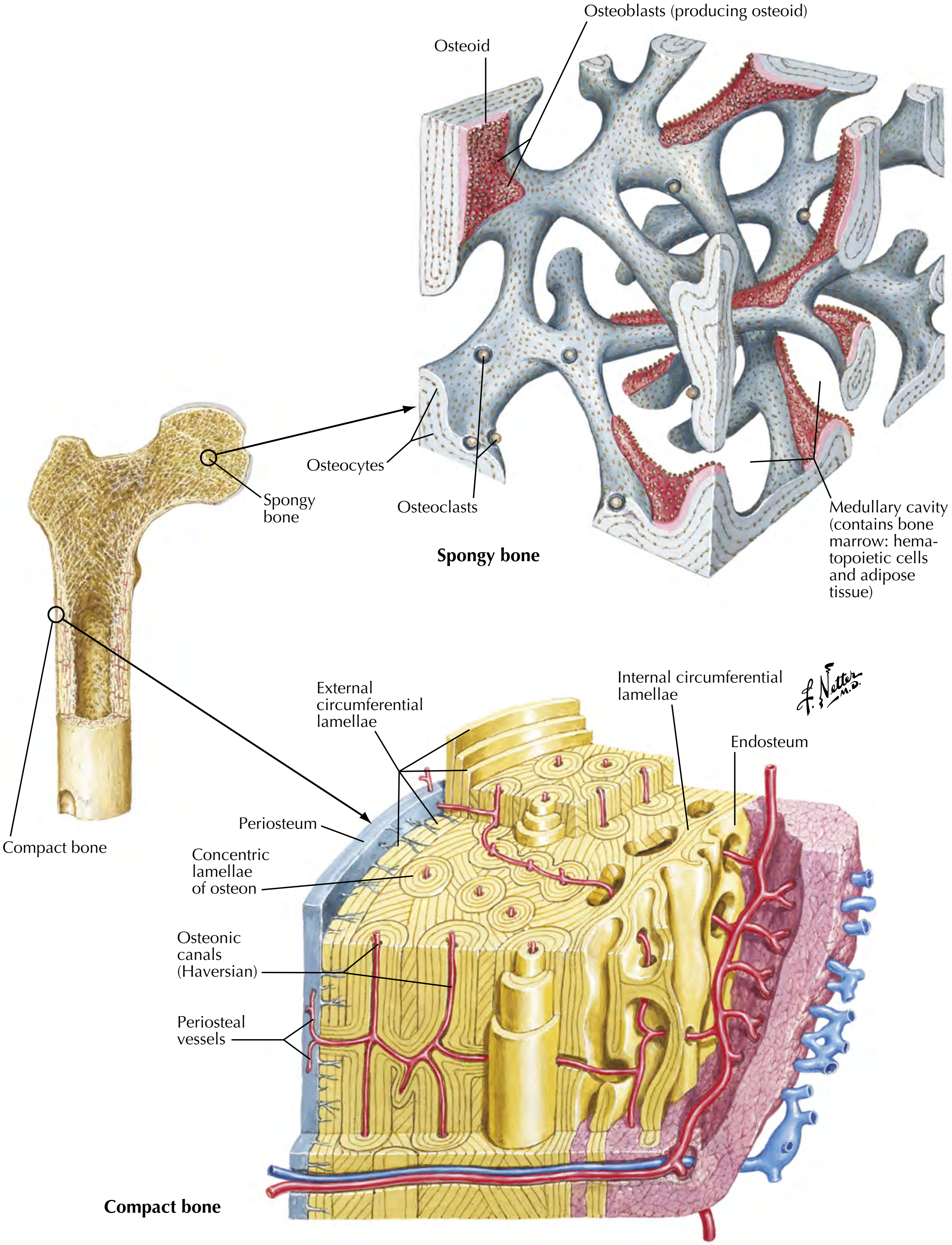
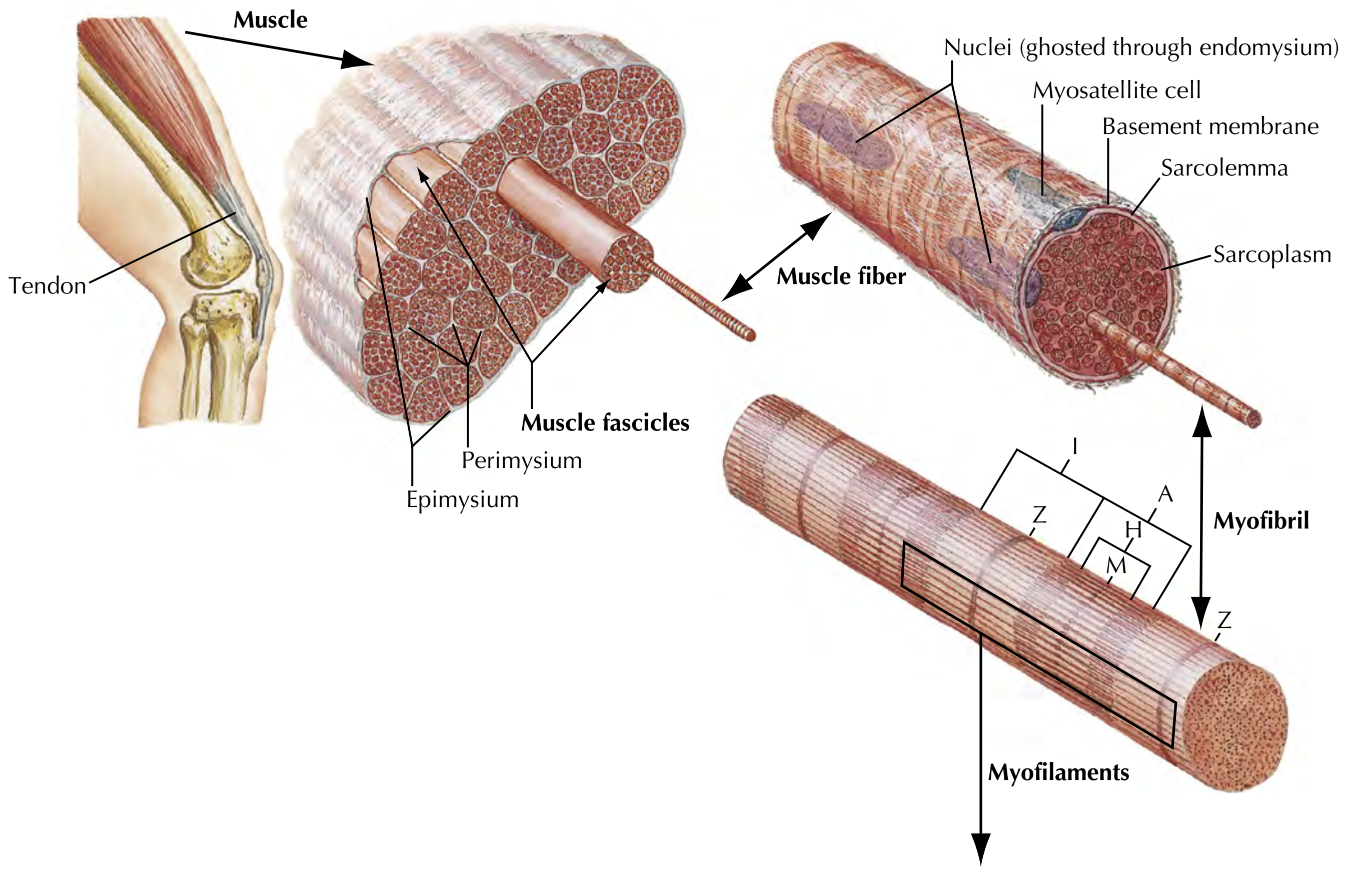
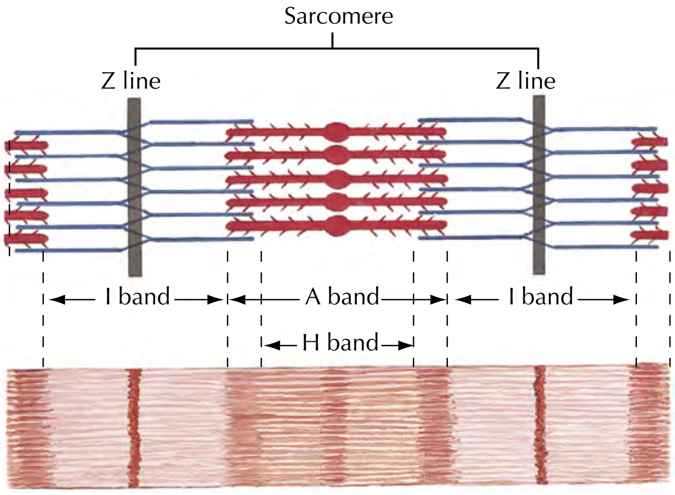
Cholinergic and Adrenergic Synapses: Schema


Medulla oblongata
Glossopharyngeal n. (CN IX)
Internal carotid n.
Vagus n. (CN X)
Parotid gland
Larynx
Trachea
Bronchi
Lungs
Heart
Cervical sympathetic ganglion
Striated m.
Sweat glands
Arrector pili mm.
Peripheral aa.
Thoracic part of spinal cord
Gray ramus communicans
White ramus communicans
Celiac ganglion
Superior mesenteric ganglion
Visceral aa.
Gastrointestinal tract
Upper lumbar part of spinal cord
Suprarenal gland
Inferior mesenteric ganglion
Pelvic splanchnic nn.
Sacral part of spinal cord
Urinary bladder
Urethra
Prostate
A
C
C Cholinergic synapses
A Adrenergic synapses
Sympathetic fibers
Presynaptic
Postsynaptic
Parasympathetic fibers
Presynaptic
Postsynaptic
Somatic fibers
Antidromic conduction

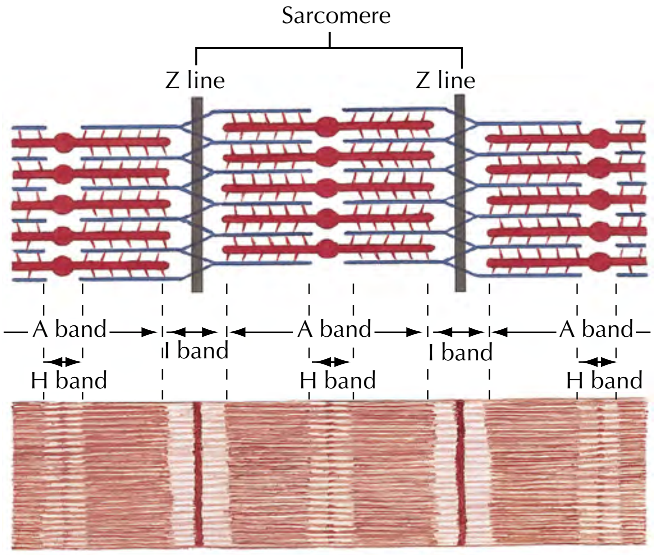

Osteoblasts (producing osteoid)
Osteoid
Osteocytes
Spongy bone
Osteoclasts
Medullary cavity (contains bone marrow: hematopoietic cells and adipose tissue)
Spongy bone
Compact bone
External circumferential lamellae
Internal circumferential lamellae
Endosteum
Periosteum
Concentric lamellae of osteon
Osteonic canals (Haversian)
Periosteal vessels
Compact bone

Muscle Structure

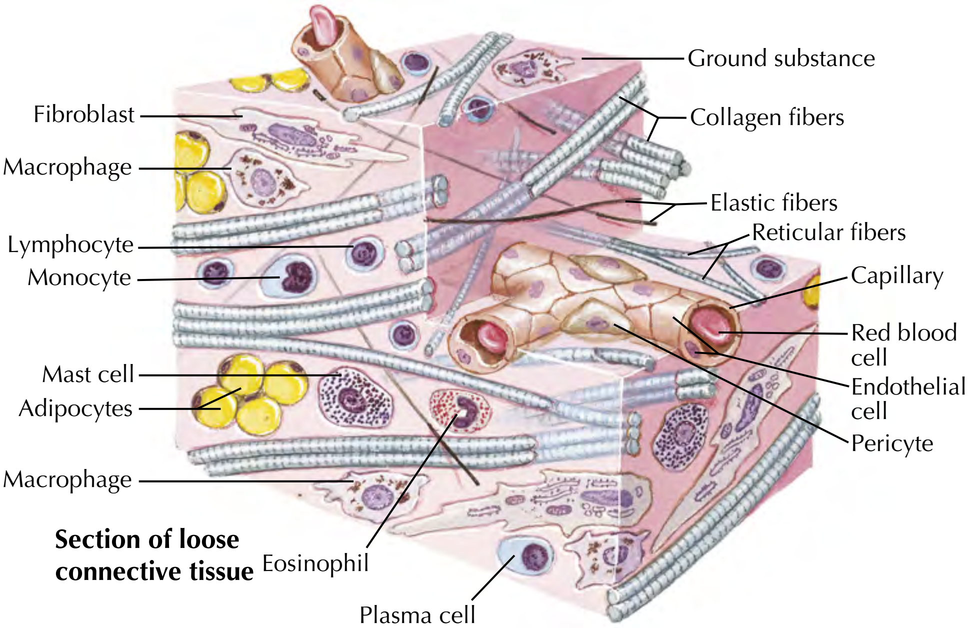

Muscle
Tendon
Muscle fascicles
Perimysium
Epimysium
Muscle fiber
Nuclei (ghosted through endomysium)
Myosatellite cell
Basement membrane
Sarcolemma
Sarcoplasm
I
A
Z
H
M
Z
Myofibril
Myofilaments


Sarcomere
Z line
Z line
I band
A band
I band
H band

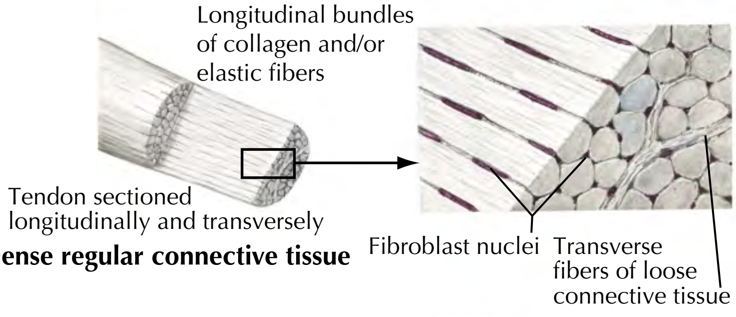
Muscle relaxed


Sarcomere
Z line
Z line
A band
I band
A band
I band
A band
H band
H band
H band

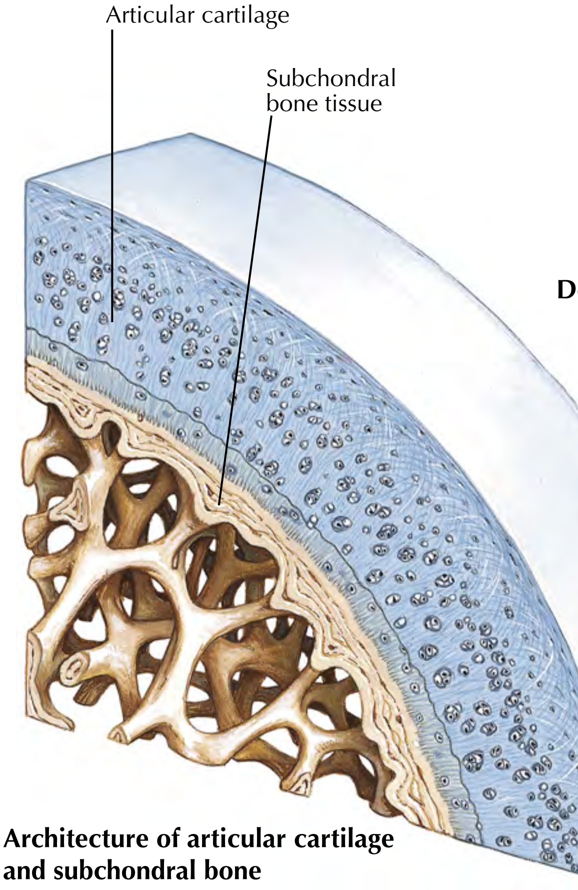
Muscle contracted


Ground substance
Collagen fibers
Fibroblast
Macrophage
Elastic fibers
Reticular fibers
Lymphocyte
Monocyte
Capillary
Red blood cell
Endothelial cell
Mast cell
Adipocytes
Pericyte
Macrophage
Eosinophil
Plasma cell

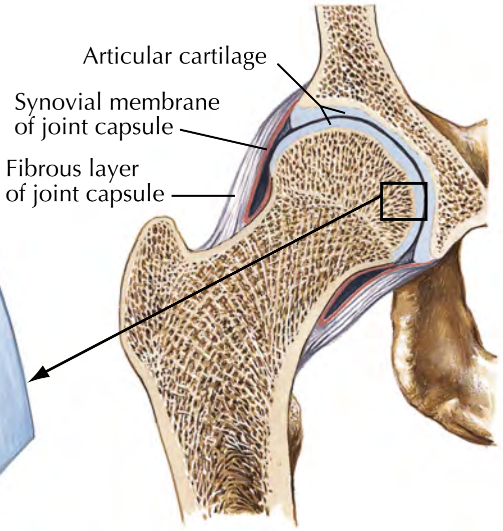
Section of loose connective tissue


Longitudinal bundles of collagen and/or elastic fibers
Tendon sectioned longitudinally and transversely
Fibroblast nuclei
Transverse fibers of loose connective tissue

Dense regular connective tissue

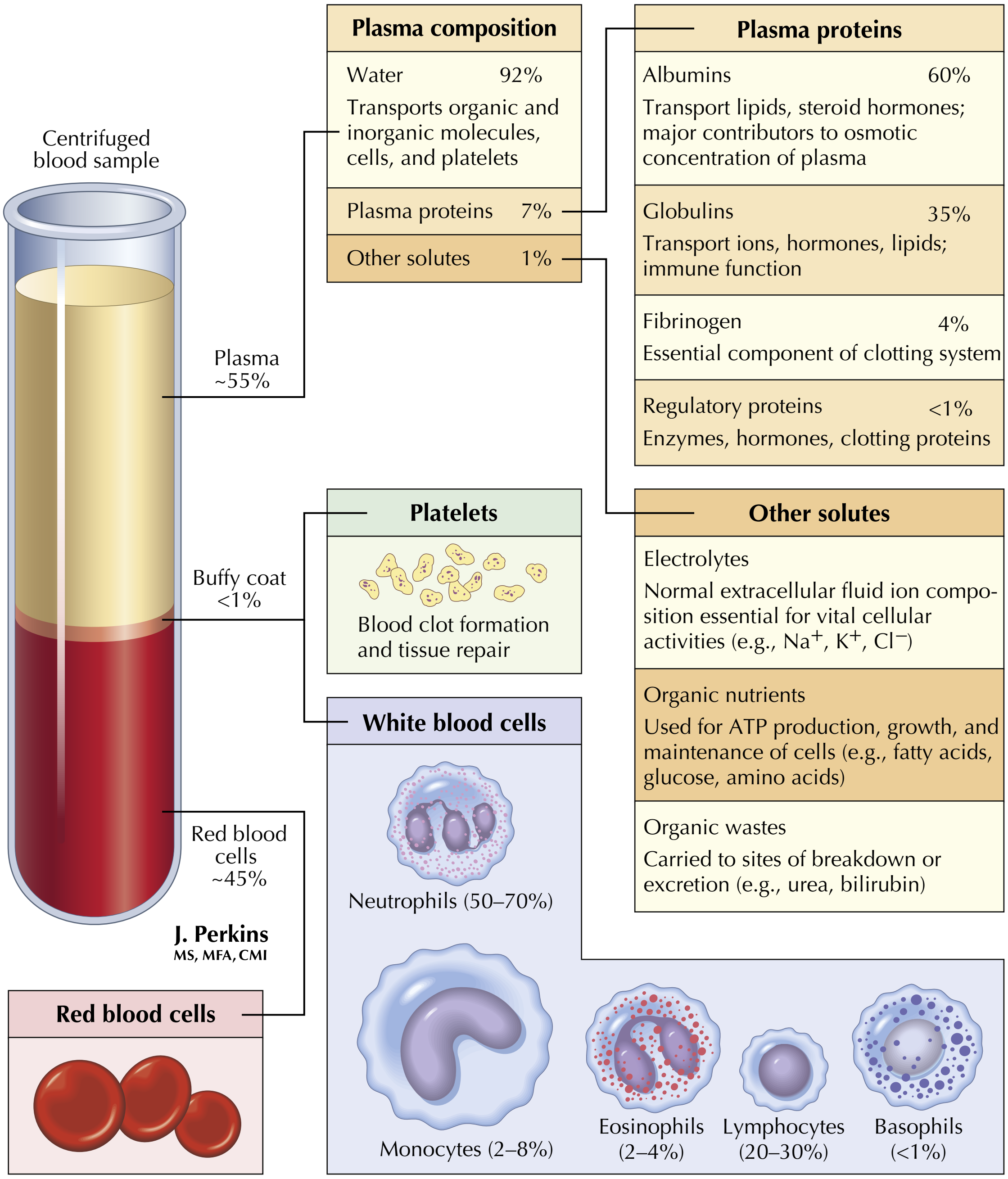

Articular cartilage
Subchondral bone tissue

Architecture of articular cartilage and subchondral bone


Articular cartilage
Synovial membrane of joint capsule
Fibrous layer of joint capsule

Joint with cartilage-covered articular surfaces

Cardiovascular System: Composition of Blood


Centrifuged blood sample
Plasma ~55%
Buffy coat <1%
Red blood cells ~45%
J. Perkins
MS, MFA, CMI
Red blood cells
Platelets
White blood cells
Neutrophils (50–70%)
Monocytes (2–8%)
Eosinophils (2–4%)
Lymphocytes (20–30%)
Basophils (<1%)

Plasma composition

Water	92%
Transports organic and inorganic molecules, cells, and platelets	
Plasma proteins	7%
Other solutes	1%

Plasma proteins

Albumins	60%
Transport lipids, steroid hormones; major contributors to osmotic concentration of plasma	
Globulins	35%
Transport ions, hormones, lipids; immune function	
Fibrinogen	4%
Essential component of clotting system	
Regulatory proteins	<1%
Enzymes, hormones, clotting proteins	

Platelets

Blood clot formation and tissue repair

Other solutes

Electrolytes

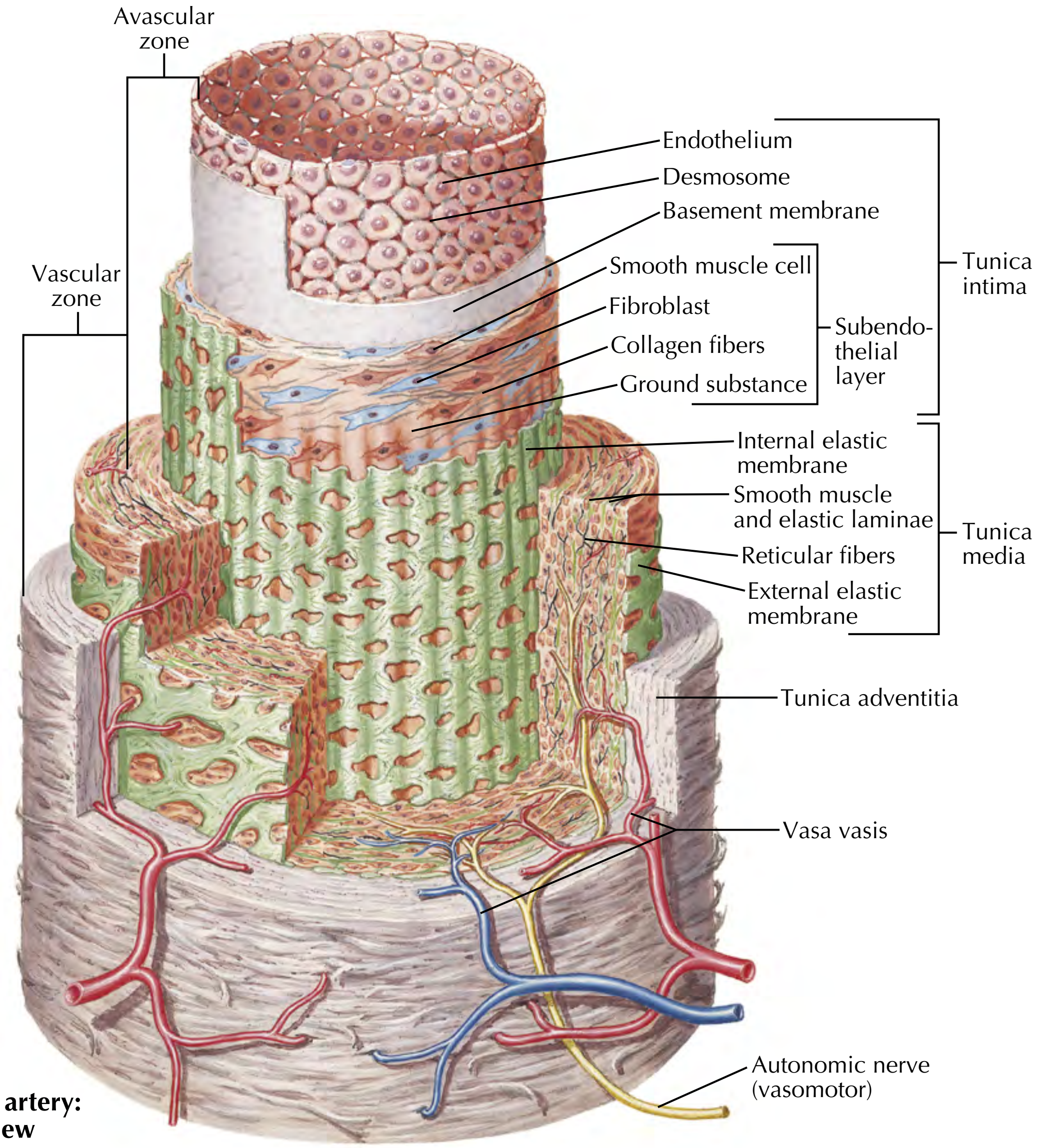
Normal extracellular fluid ion composition essential for vital cellular activities (e.g., Na^+, K^+, Cl^-)

Organic nutrients

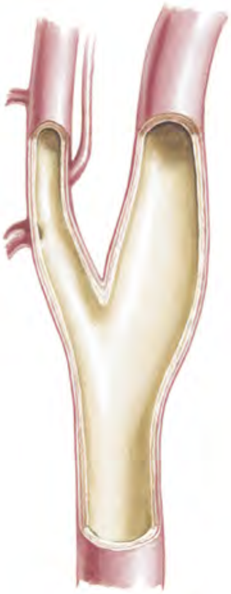
Used for ATP production, growth, and maintenance of cells (e.g., fatty acids, glucose, amino acids)

Organic wastes

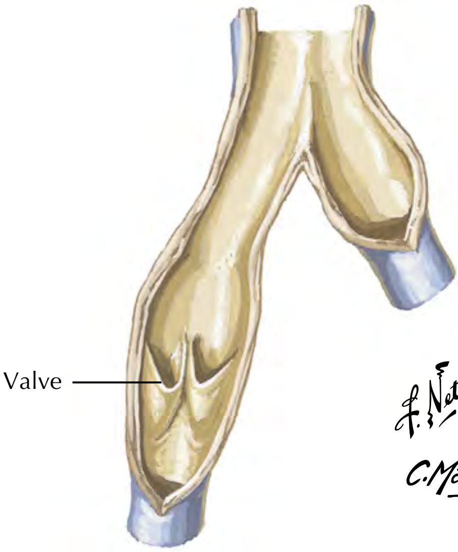
Carried to sites of breakdown or excretion (e.g., urea, bilirubin)


Avascular zone
Vascular zone
Endothelium
Desmosome
Basement membrane
Smooth muscle cell
Fibroblast
Collagen fibers
Ground substance
Subendothelial layer
Tunica intima
Internal elastic membrane
Smooth muscle and elastic laminae
Reticular fibers
External elastic membrane
Tunica media
Tunica adventitia
Vasa vasis
Autonomic nerve (vasomotor)

Wall of an artery: cutaway view



Artery



Vein

F. Netter M.D.
C. Machado M.D.

HEAD AND NECK

2

Surface Anatomy 22–24
Bones and Joints 25–47
Neck 48–58
Nose 59–82
Mouth 83–90
Pharynx 91–102
Larynx and Endocrine Glands 103–109
Eye 110–120
Ear 121–126
Brain and Meninges 127–142
Cranial and Cervical Nerves 143–162
Cerebral Vasculature 163–175
Regional Imaging 176–177
Structures with High Clinical Significance Tables 2.1–2.4
Cranial Nerves Tables 2.5–2.8
Branches of Cervical Plexus Table 2.9
Muscles Tables 2.10–2.14
Electronic Bonus Plates BP 14–BP 32

ELECTRONIC BONUS PLATES

BP 14 Somatosensory System: Trunk and Limbs

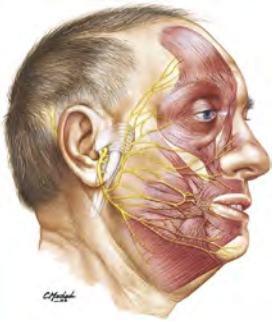
BP 15 Pyramidal System

BP 16 3D Skull Reconstruction CTs

BP 17 Degenerative Changes in Cervical Vertebrae

BP 18 Atlantooccipital Junction

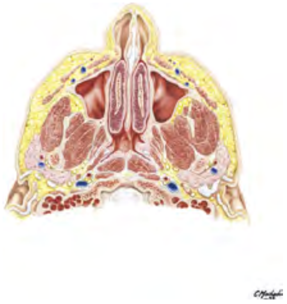
BP 19 Muscles of Facial Expression: Anterior View

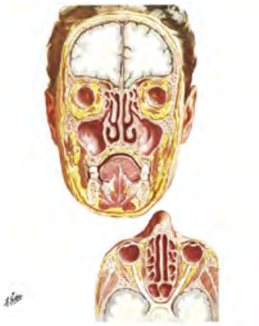


BP 20 Musculature of Face

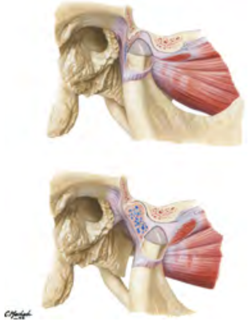
BP 21 Arteries of Nasal Cavity: Bony Nasal Septum Turned Up

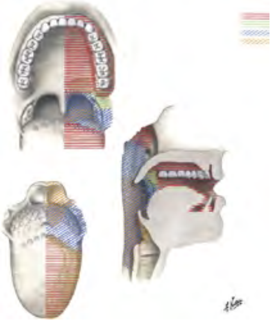
ELECTRONIC BONUS PLATES—*cont'd*


BP 22 Nose and Maxillary Sinus: Transverse Section

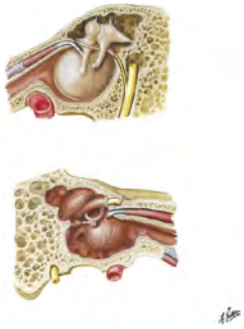

BP 23 Paranasal Sinuses

BP 24 Subclavian Artery


BP 25 Opening of the Mandible


BP 26 Afferent Innervation of Oral Cavity and Pharynx

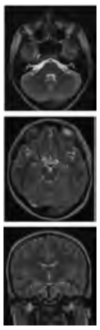
BP 27 Fasciae of Orbit and Eyeball


BP 28 Tympanic Cavity: Medial and Lateral Views

BP 29 Anatomy of the Pediatric Ear

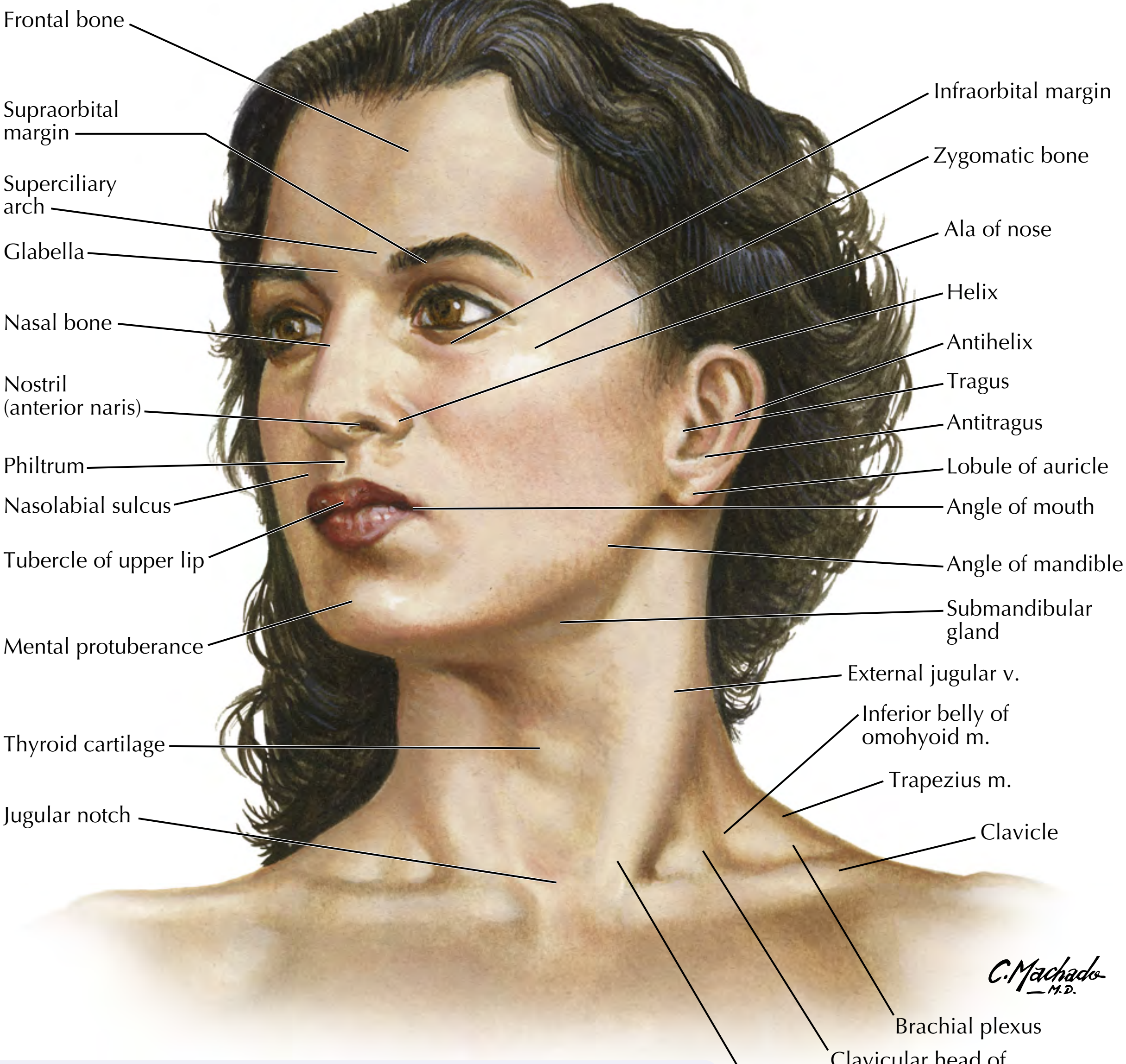
BP 30 Auditory Tube (Eustachian)

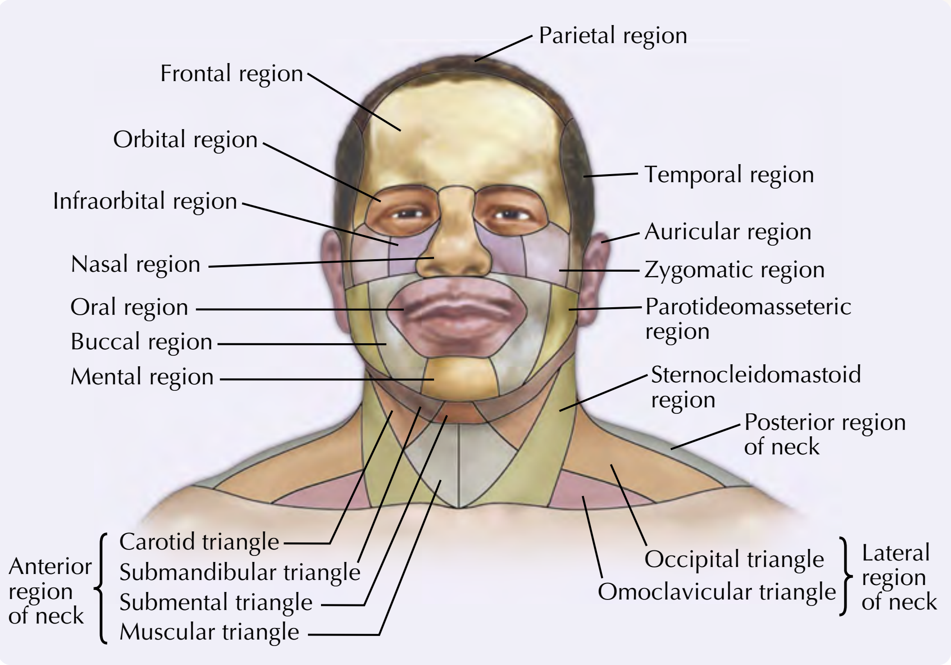
BP 31 Cranial Imaging (MRV and MRA)


BP 32 Axial and Coronal MRIs of Brain

Surface Anatomy of Head and Neck

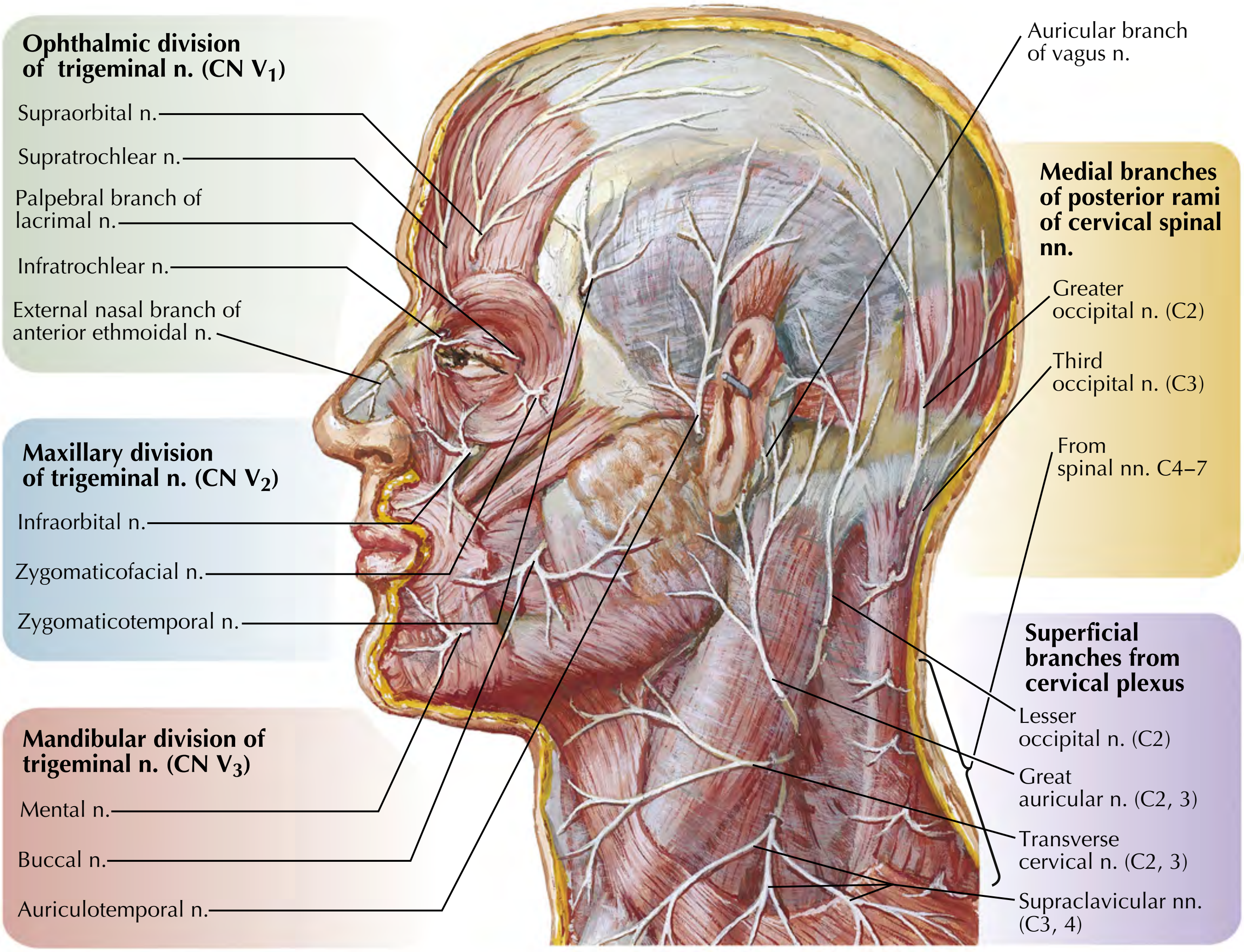
See also **Plates 18, 188**

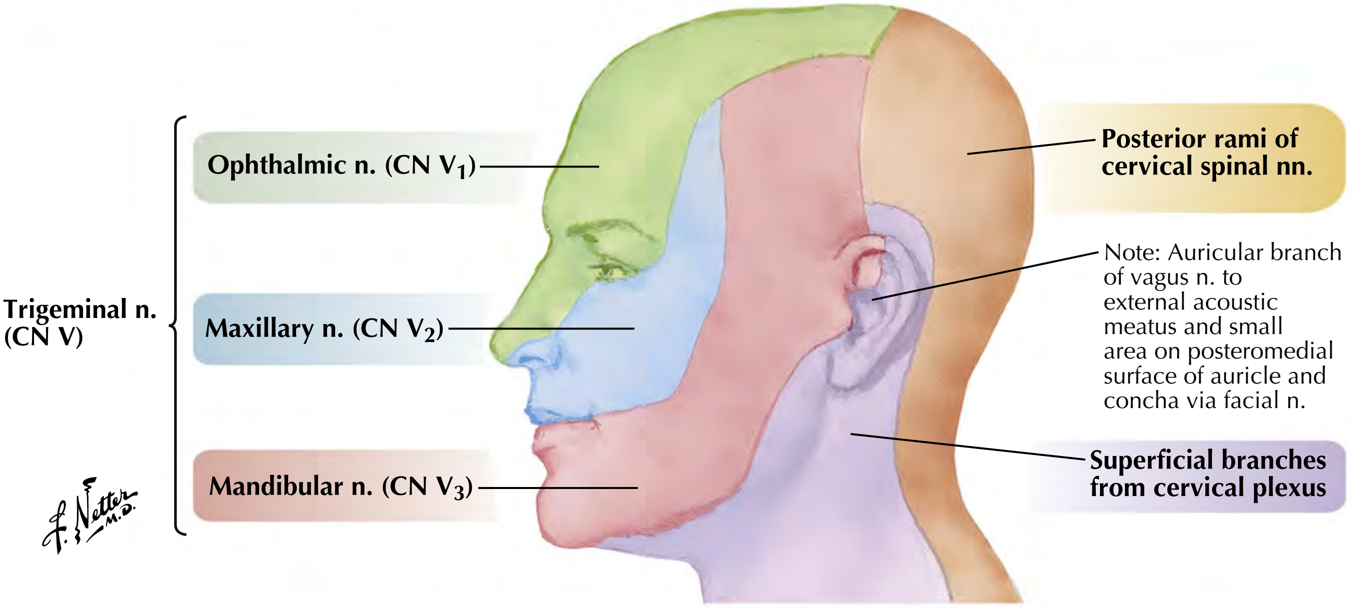

Frontal bone
Supraorbital margin
Superciliary arch
Glabella
Nasal bone
Nostril (anterior naris)
Philtrum
Nasolabial sulcus
Tubercle of upper lip
Mental protuberance
Thyroid cartilage
Jugular notch
Infraorbital margin
Zygomatic bone
Ala of nose
Helix
Antihelix
Tragus
Antitragus
Lobule of auricle
Angle of mouth
Angle of mandible
Submandibular gland
External jugular v.
Inferior belly of omohyoid m.
Trapezius m.
Clavicle
C. Machado M.D.
Brachial plexus
Clavicular head of sternocleidomastoid m.
Sternal head of sternocleidomastoid m.


Parietal region
Frontal region
Orbital region
Infraorbital region
Nasal region
Oral region
Buccal region
Mental region
Temporal region
Auricular region
Zygomatic region
Parotideomasseteric region
Sternocleidomastoid region
Posterior region of neck
Anterior region of neck
Carotid triangle
Submandibular triangle
Submental triangle
Muscular triangle
Occipital triangle
Omoclavicular triangle
Lateral region of neck

Cutaneous Nerves of Head and Neck

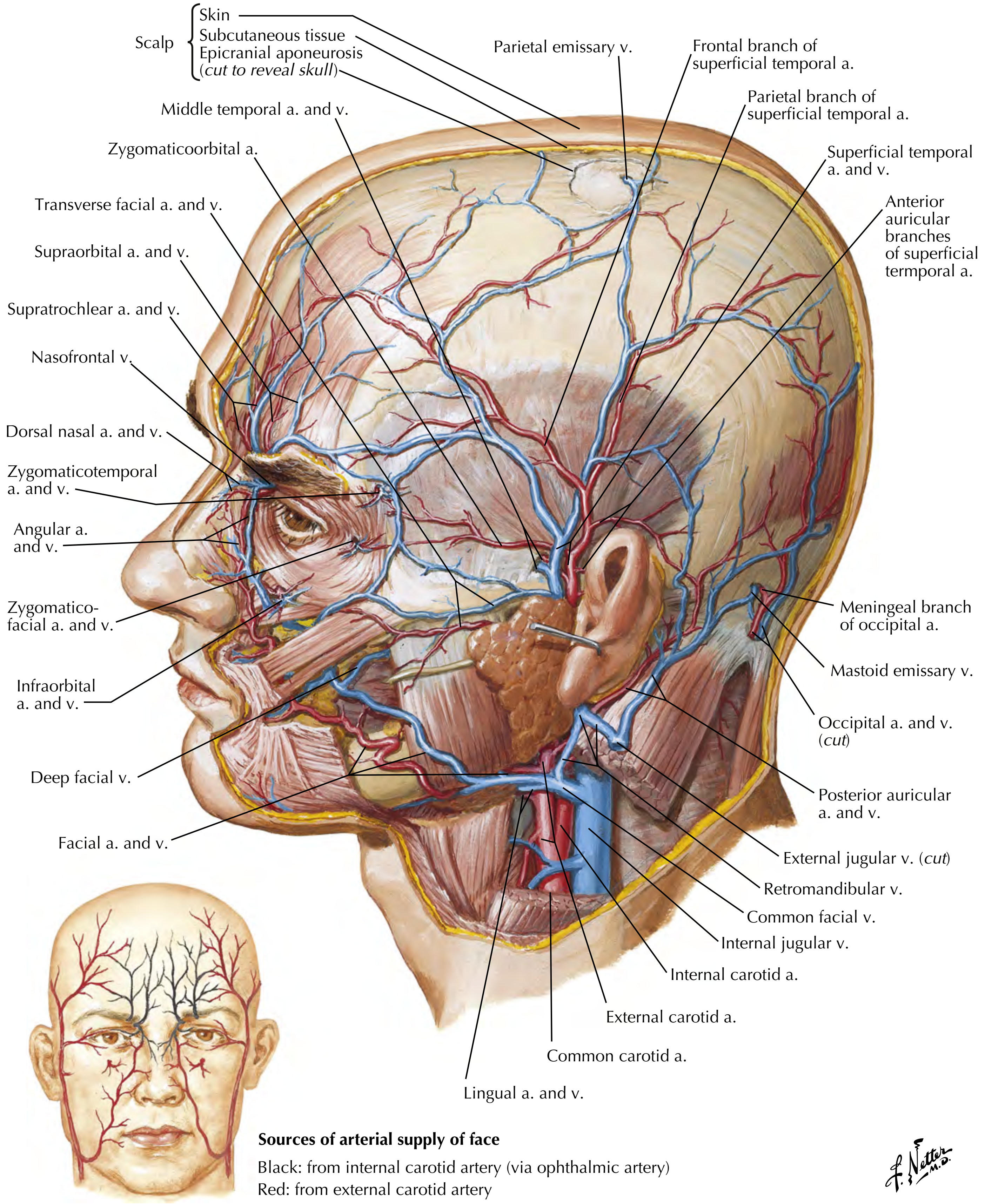
See also **Plates 6, 59, 60, 79**


Ophthalmic division of trigeminal n. (CN V_1)
Supraorbital n.
Supratrochlear n.
Palpebral branch of lacrimal n.
Infratrochlear n.
External nasal branch of anterior ethmoidal n.
Maxillary division of trigeminal n. (CN V_2)
Infraorbital n.
Zygomaticofacial n.
Zygomaticotemporal n.
Mandibular division of trigeminal n. (CN V_3)
Mental n.
Buccal n.
Auriculotemporal n.
Auricular branch of vagus n.
Medial branches of posterior rami of cervical spinal nn.
Greater occipital n. (C2)
Third occipital n. (C3)
From spinal nn. C4–7
Superficial branches from cervical plexus
Lesser occipital n. (C2)
Great auricular n. (C2, 3)
Transverse cervical n. (C2, 3)
Supraclavicular nn. (C3, 4)


Trigeminal n. (CN V)
Ophthalmic n. (CN V_1)
Maxillary n. (CN V_2)
Mandibular n. (CN V_3)
Posterior rami of cervical spinal nn.
Note: Auricular branch of vagus n. to external acoustic meatus and small area on posteromedial surface of auricle and concha via facial n.
Superficial branches from cervical plexus

Superficial Arteries and Veins of Face and Scalp

See also **Plates 74, 99, 100**

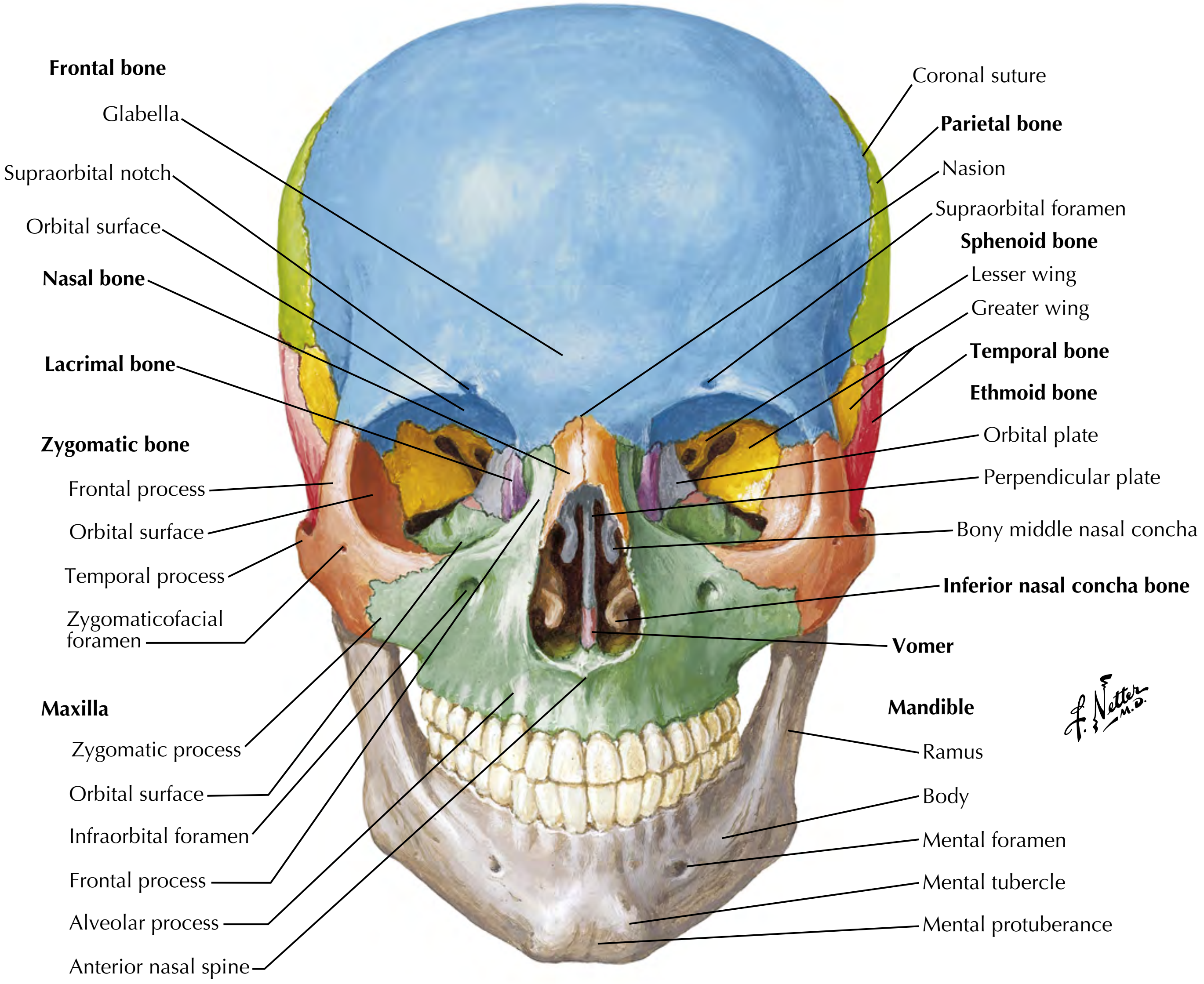

Scalp
Skin
Subcutaneous tissue
Epicranial aponeurosis
(*cut to reveal skull*)
Middle temporal a. and v.
Zygomaticoorbital a.
Transverse facial a. and v.
Supraorbital a. and v.
Supratrochlear a. and v.
Nasofrontal v.
Dorsal nasal a. and v.
Zygomaticotemporal a. and v.
Angular a. and v.
Zygomatico-facial a. and v.
Infraorbital a. and v.
Deep facial v.
Facial a. and v.
Parietal emissary v.
Frontal branch of superficial temporal a.
Parietal branch of superficial temporal a.
Superficial temporal a. and v.
Anterior auricular branches of superficial termporal a.
Meningeal branch of occipital a.
Mastoid emissary v.
Occipital a. and v. (*cut*)
Posterior auricular a. and v.
External jugular v. (*cut*)
Retromandibular v.
Common facial v.
Internal jugular v.
Internal carotid a.
External carotid a.
Common carotid a.
Lingual a. and v.

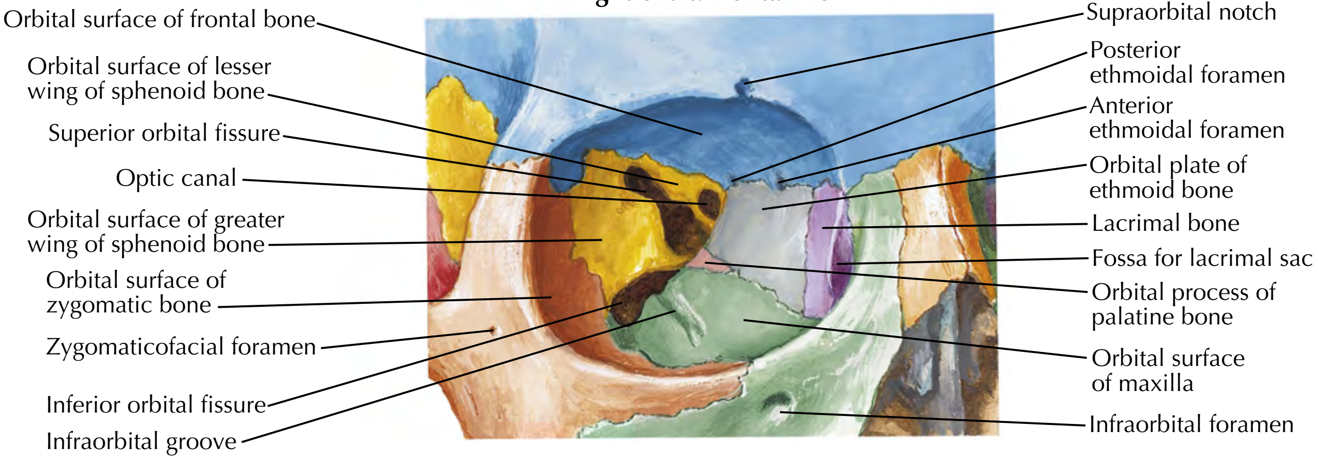
Sources of arterial supply of face

Black: from internal carotid artery (via ophthalmic artery)
Red: from external carotid artery

Skull: Anterior View

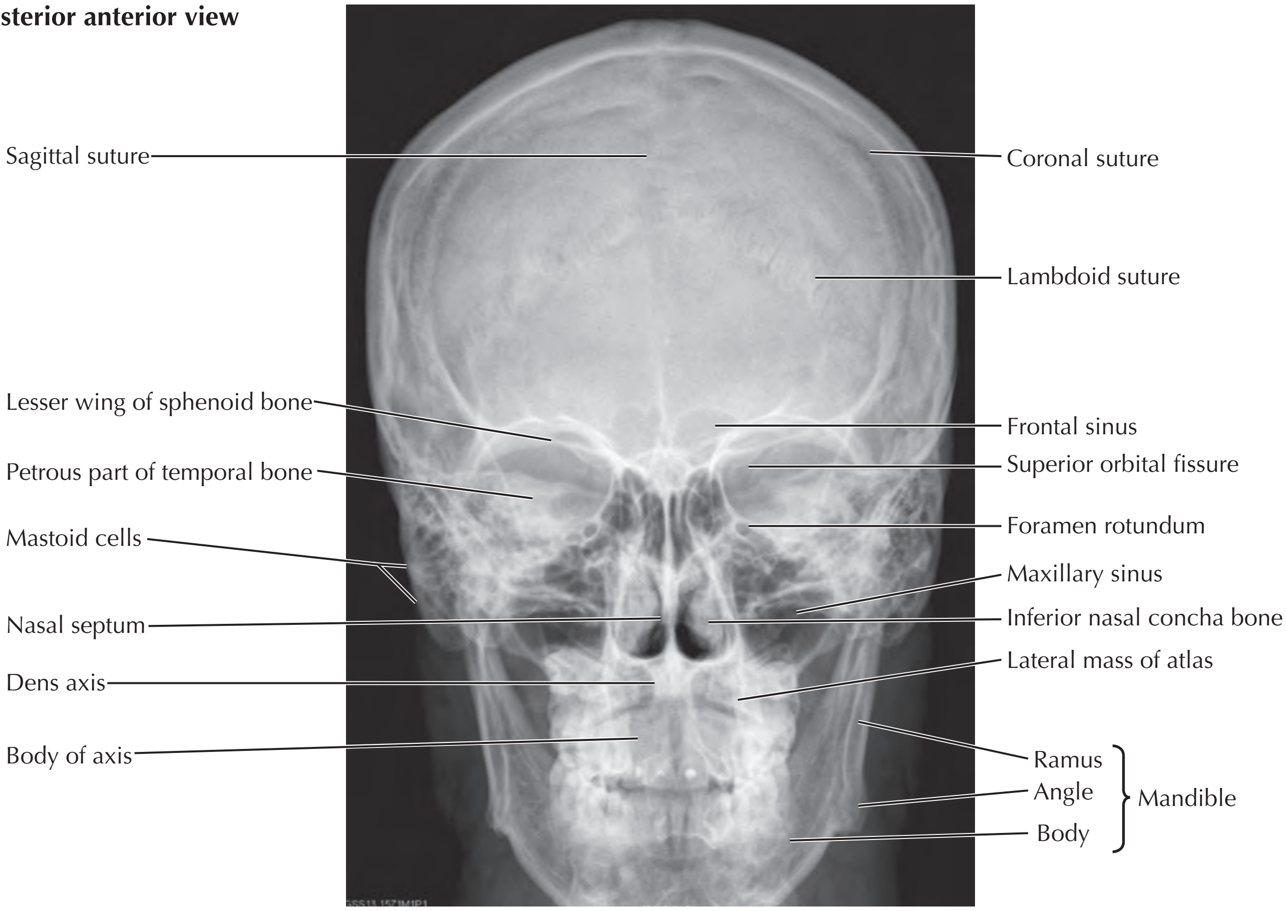
See also **Plate 27**


Frontal bone
Glabella
Supraorbital notch
Orbital surface
Nasal bone
Lacrimal bone
Zygomatic bone
Frontal process
Orbital surface
Temporal process
Zygomaticofacial foramen
Maxilla
Zygomatic process
Orbital surface
Infraorbital foramen
Frontal process
Alveolar process
Anterior nasal spine
Coronal suture
Parietal bone
Nasion
Supraorbital foramen
Sphenoid bone
Lesser wing
Greater wing
Temporal bone
Ethmoid bone
Orbital plate
Perpendicular plate
Bony middle nasal concha
Inferior nasal concha bone
Vomer
Mandible
Ramus
Body
Mental foramen
Mental tubercle
Mental protuberance

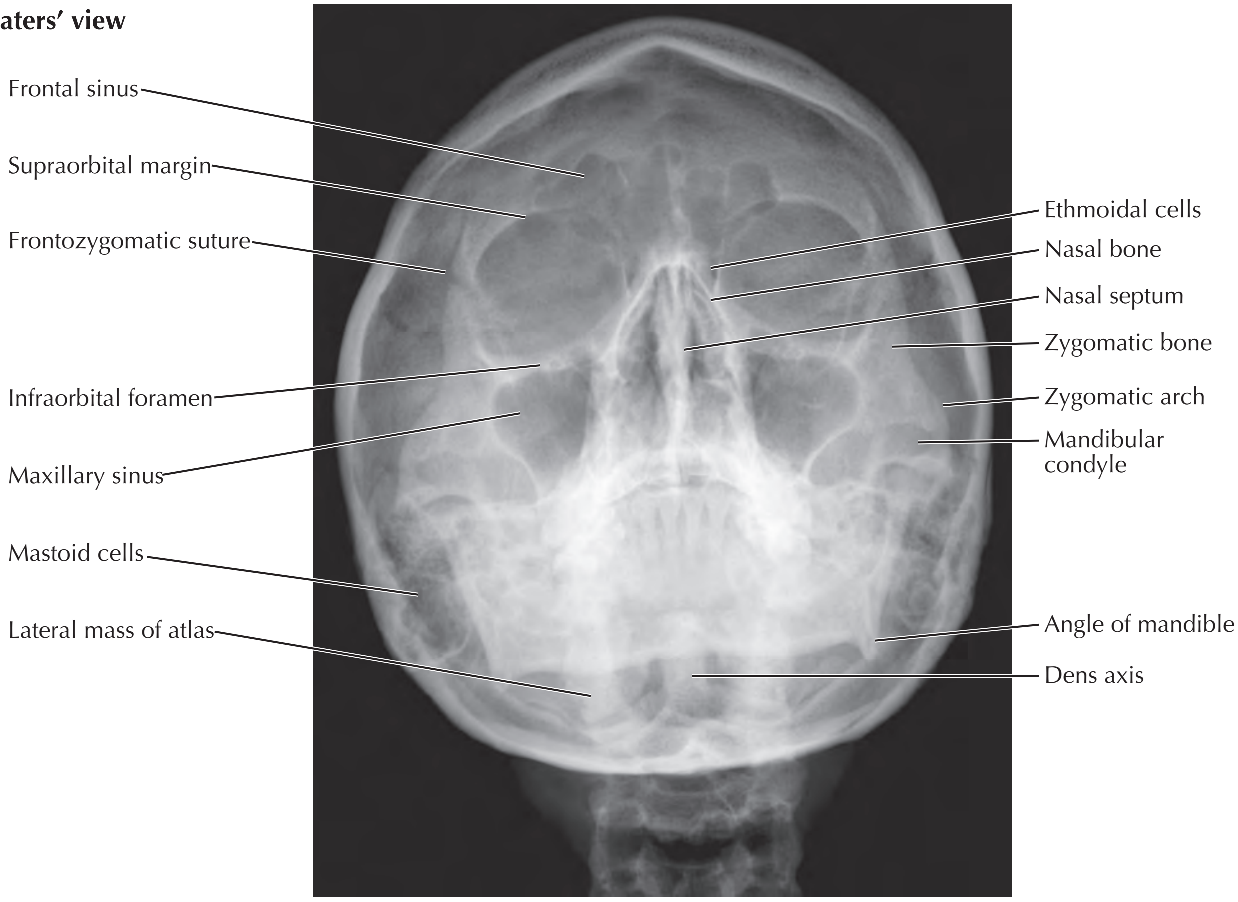

Right orbit: frontal view

Orbital surface of frontal bone
Orbital surface of lesser wing of sphenoid bone
Superior orbital fissure
Optic canal
Orbital surface of greater wing of sphenoid bone
Orbital surface of zygomatic bone
Zygomaticofacial foramen
Inferior orbital fissure
Infraorbital groove
Supraorbital notch
Posterior ethmoidal foramen
Anterior ethmoidal foramen
Orbital plate of ethmoid bone
Lacrimal bone
Fossa for lacrimal sac
Orbital process of palatine bone
Orbital surface of maxilla
Infraorbital foramen

Posterior anterior view

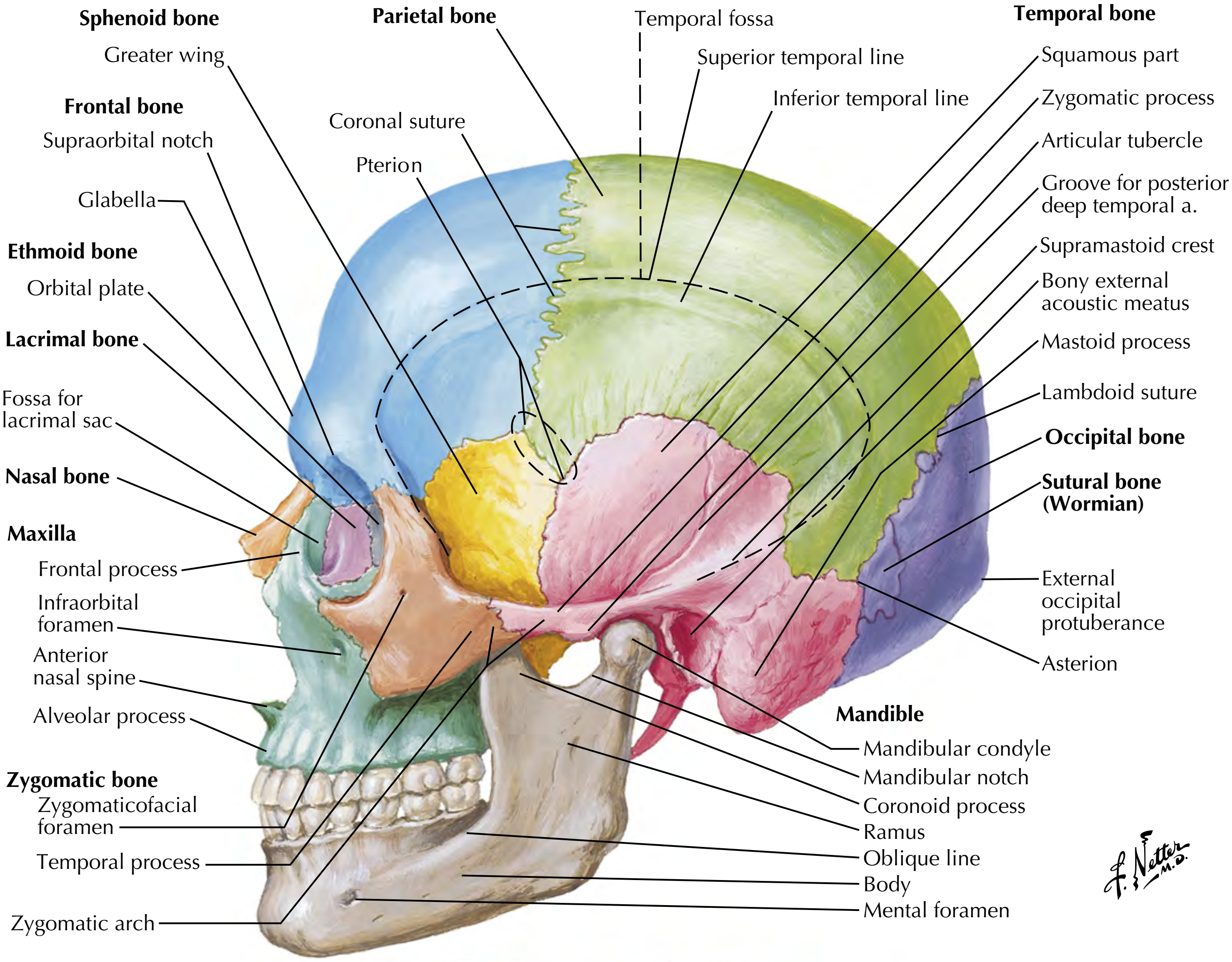

Sagittal suture
Lesser wing of sphenoid bone
Petrous part of temporal bone
Mastoid cells
Nasal septum
Dens axis
Body of axis
Coronal suture
Lambdoid suture
Frontal sinus
Superior orbital fissure
Foramen rotundum
Maxillary sinus
Inferior nasal concha bone
Lateral mass of atlas
Ramus
Angle
Body
Mandible

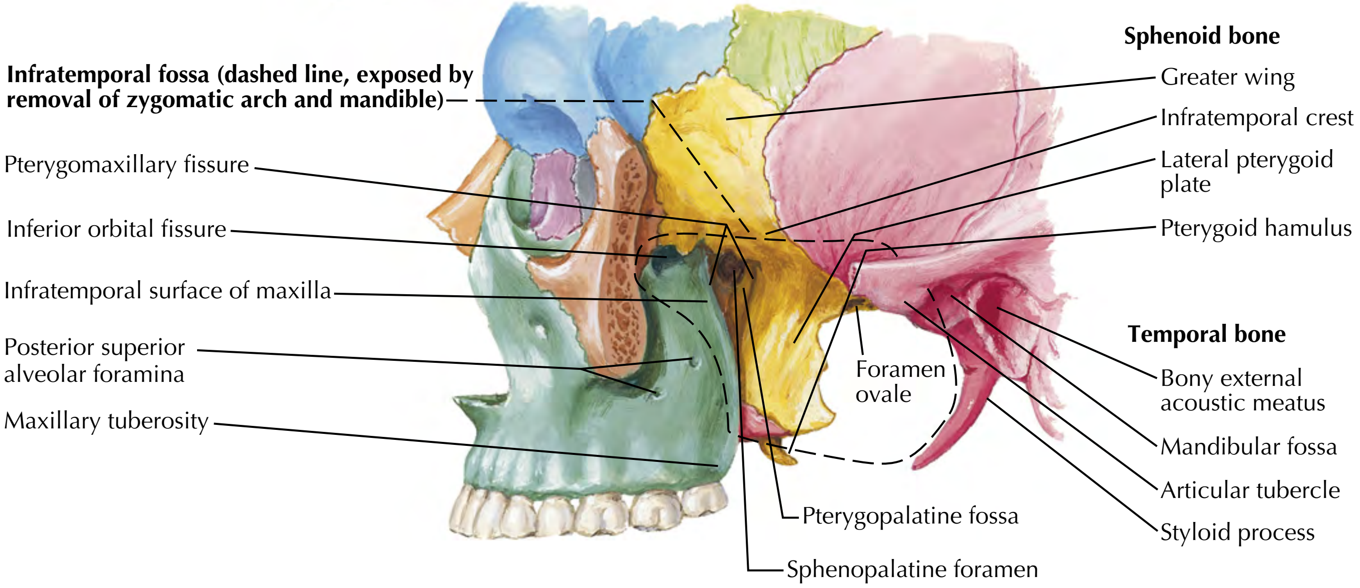
Waters' view


Frontal sinus
Supraorbital margin
Frontozygomatic suture
Infraorbital foramen
Maxillary sinus
Mastoid cells
Lateral mass of atlas
Ethmoidal cells
Nasal bone
Nasal septum
Zygomatic bone
Zygomatic arch
Mandibular condyle
Angle of mandible
Dens axis

Skull: Lateral View

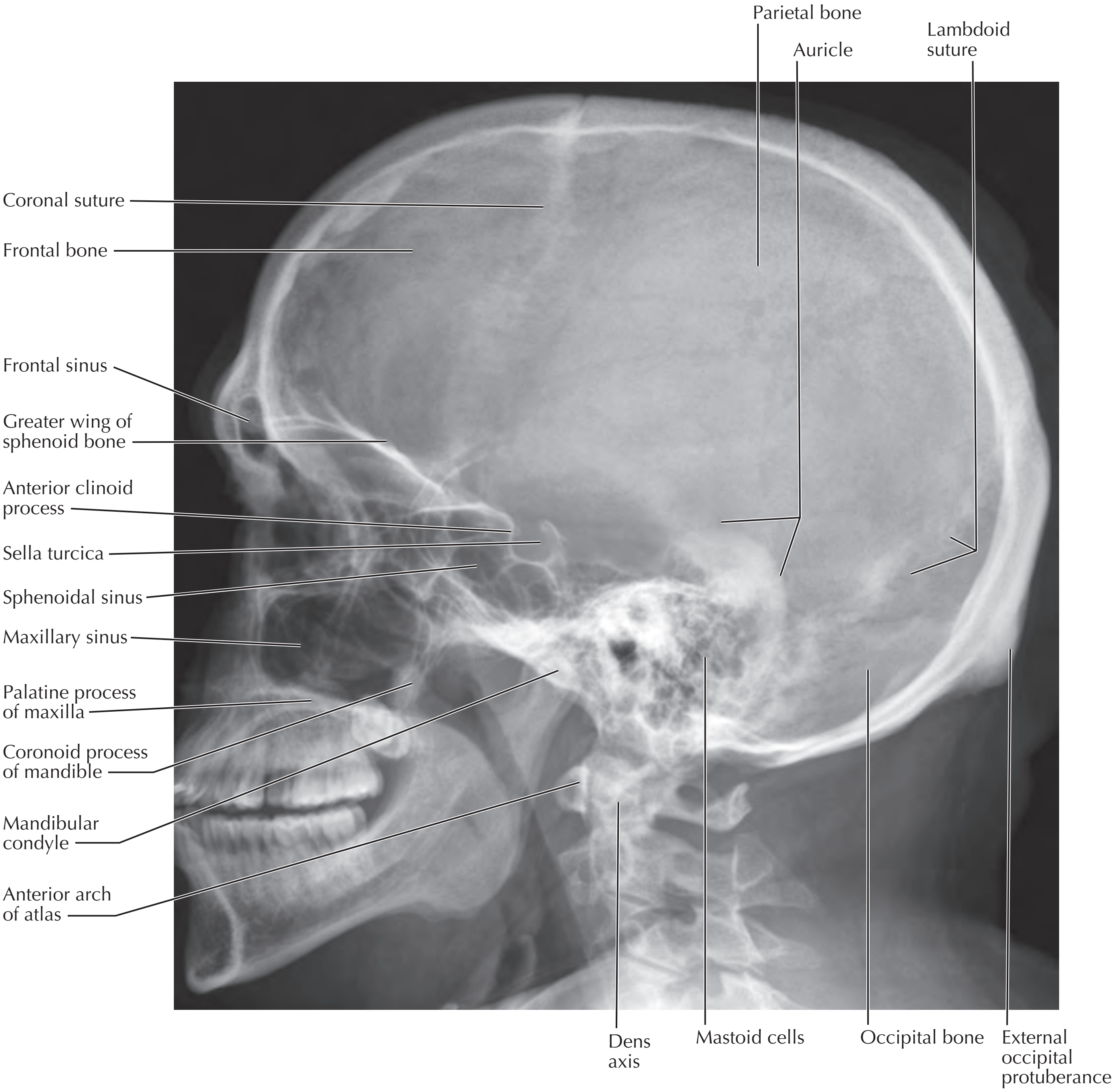
See also **Plates 28, 29, 36**


Sphenoid bone
Greater wing
Frontal bone
Supraorbital notch
Glabella
Ethmoid bone
Orbital plate
Lacrimal bone
Fossa for lacrimal sac
Nasal bone
Maxilla
Frontal process
Infraorbital foramen
Anterior nasal spine
Alveolar process
Zygomatic bone
Zygomaticofacial foramen
Temporal process
Zygomatic arch
Parietal bone
Coronal suture
Pterion
Temporal fossa
Superior temporal line
Inferior temporal line
Temporal bone
Squamous part
Zygomatic process
Articular tubercle
Groove for posterior deep temporal a.
Supramastoid crest
Bony external acoustic meatus
Mastoid process
Lambdoid suture
Occipital bone
Sutural bone (Wormian)
External occipital protuberance
Asterion
Mandible
Mandibular condyle
Mandibular notch
Coronoid process
Ramus
Oblique line
Body
Mental foramen


Infratemporal fossa (dashed line, exposed by removal of zygomatic arch and mandible)
Pterygomaxillary fissure
Inferior orbital fissure
Infratemporal surface of maxilla
Posterior superior alveolar foramina
Maxillary tuberosity
Sphenoid bone
Greater wing
Infratemporal crest
Lateral pterygoid plate
Pterygoid hamulus
Foramen ovale
Temporal bone
Bony external acoustic meatus
Mandibular fossa
Articular tubercle
Styloid process
Pterygopalatine fossa
Sphenopalatine foramen

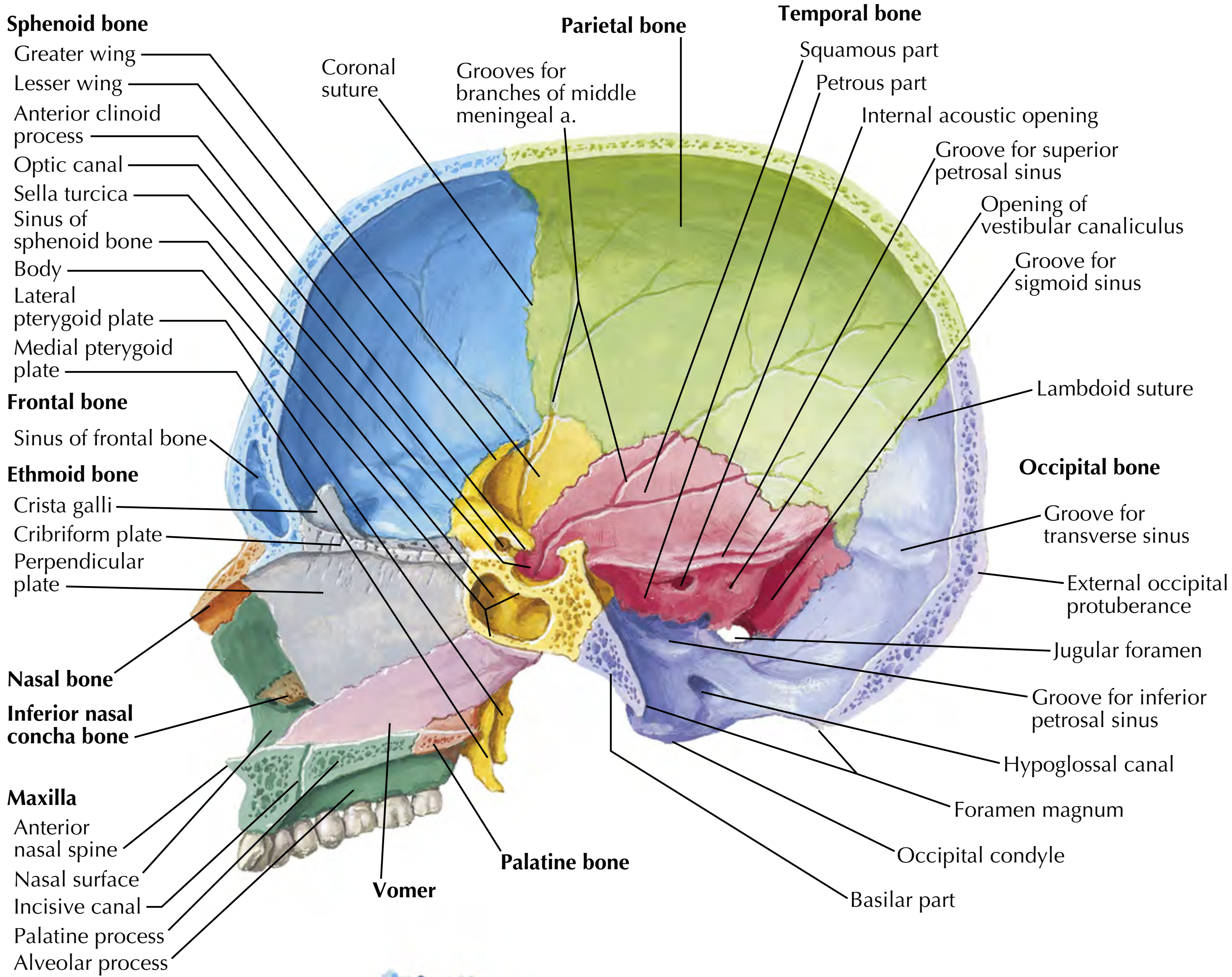
Skull: Lateral Radiograph

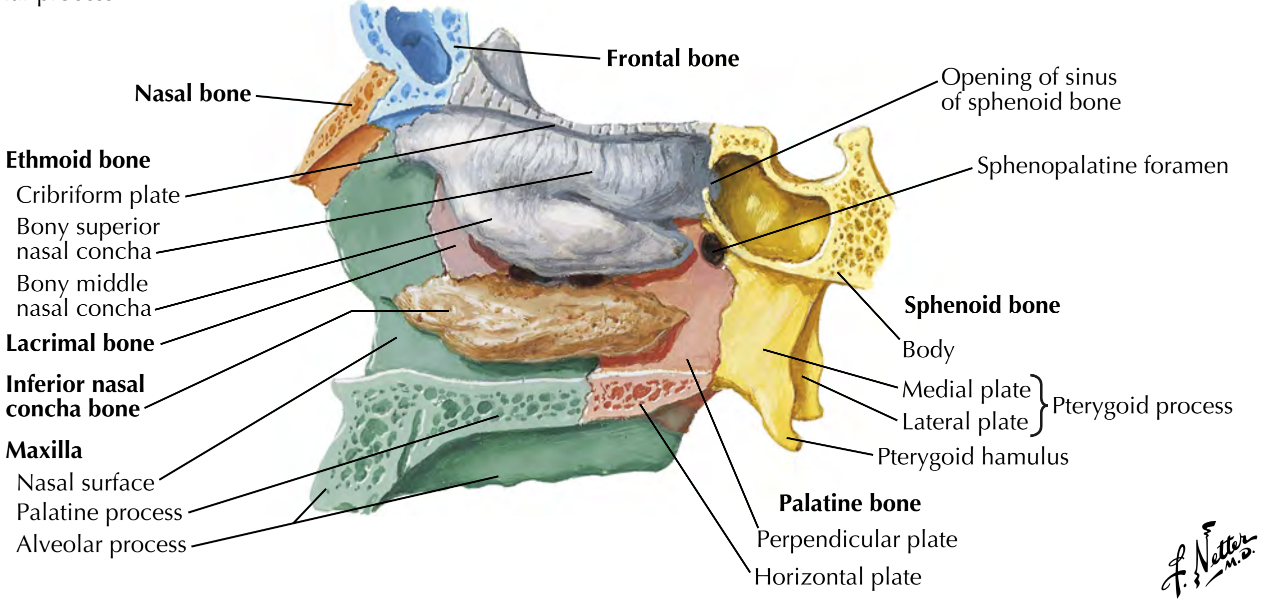
See also **Plates 29, BP 35**


Parietal bone
Auricle
Lambdoid suture
Coronal suture
Frontal bone
Frontal sinus
Greater wing of sphenoid bone
Anterior clinoid process
Sella turcica
Sphenoidal sinus
Maxillary sinus
Palatine process of maxilla
Coronoid process of mandible
Mandibular condyle
Anterior arch of atlas
Dens axis
Mastoid cells
Occipital bone
External occipital protuberance

Cranium: Median Section

See also **Plates 17, 64**

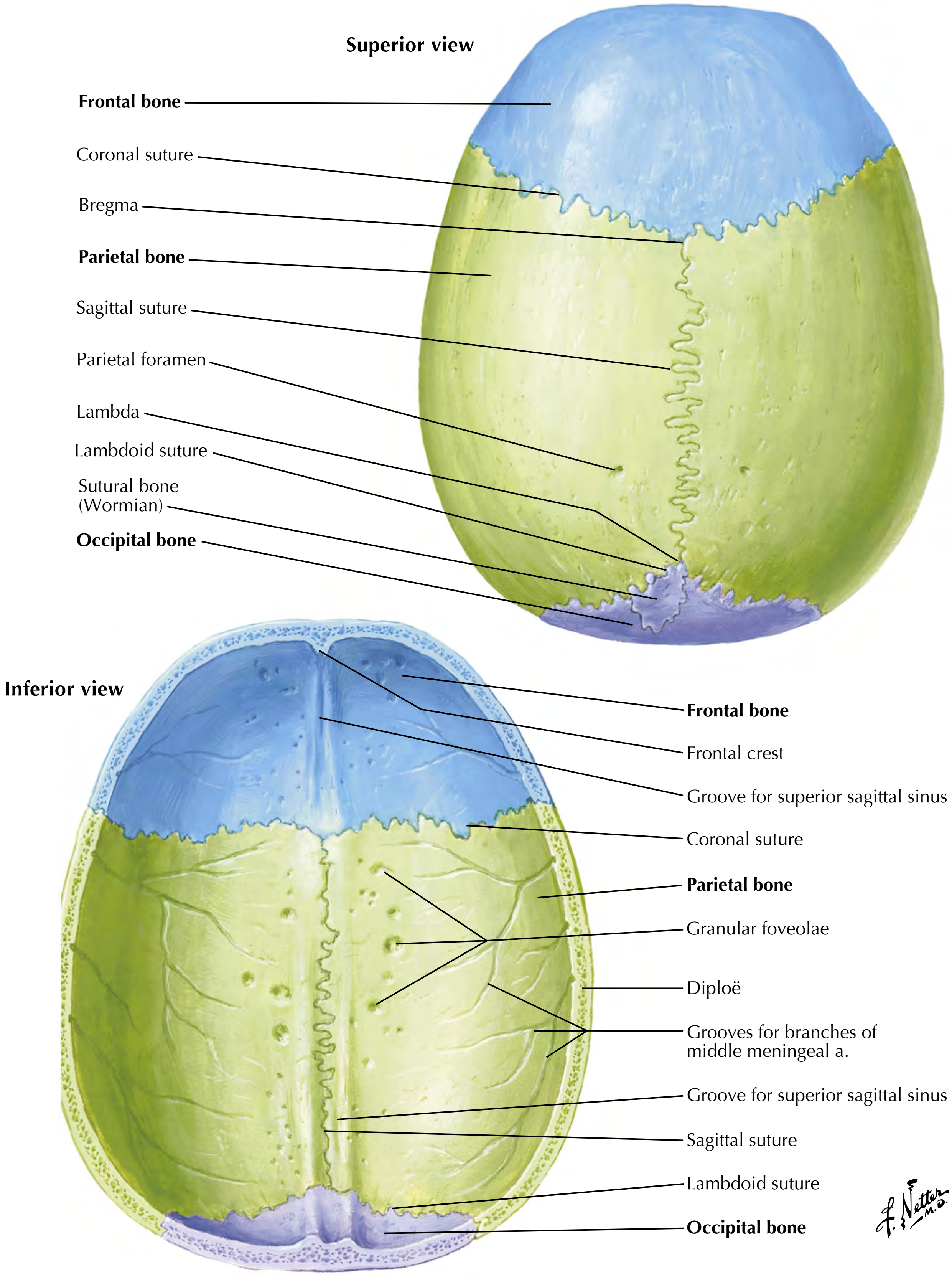

Sphenoid bone
Greater wing
Lesser wing
Anterior clinoid process
Optic canal
Sella turcica
Sinus of sphenoid bone
Body
Lateral pterygoid plate
Medial pterygoid plate
Frontal bone
Sinus of frontal bone
Ethmoid bone
Crista galli
Cribriform plate
Perpendicular plate
Nasal bone
Inferior nasal concha bone
Maxilla
Anterior nasal spine
Nasal surface
Incisive canal
Palatine process
Alveolar process
Coronal suture
Grooves for branches of middle meningeal a.
Parietal bone
Temporal bone
Squamous part
Petrous part
Internal acoustic opening
Groove for superior petrosal sinus
Opening of vestibular canaliculus
Groove for sigmoid sinus
Lambdoid suture
Occipital bone
Groove for transverse sinus
External occipital protuberance
Jugular foramen
Groove for inferior petrosal sinus
Hypoglossal canal
Foramen magnum
Occipital condyle
Basilar part
Vomer
Palatine bone

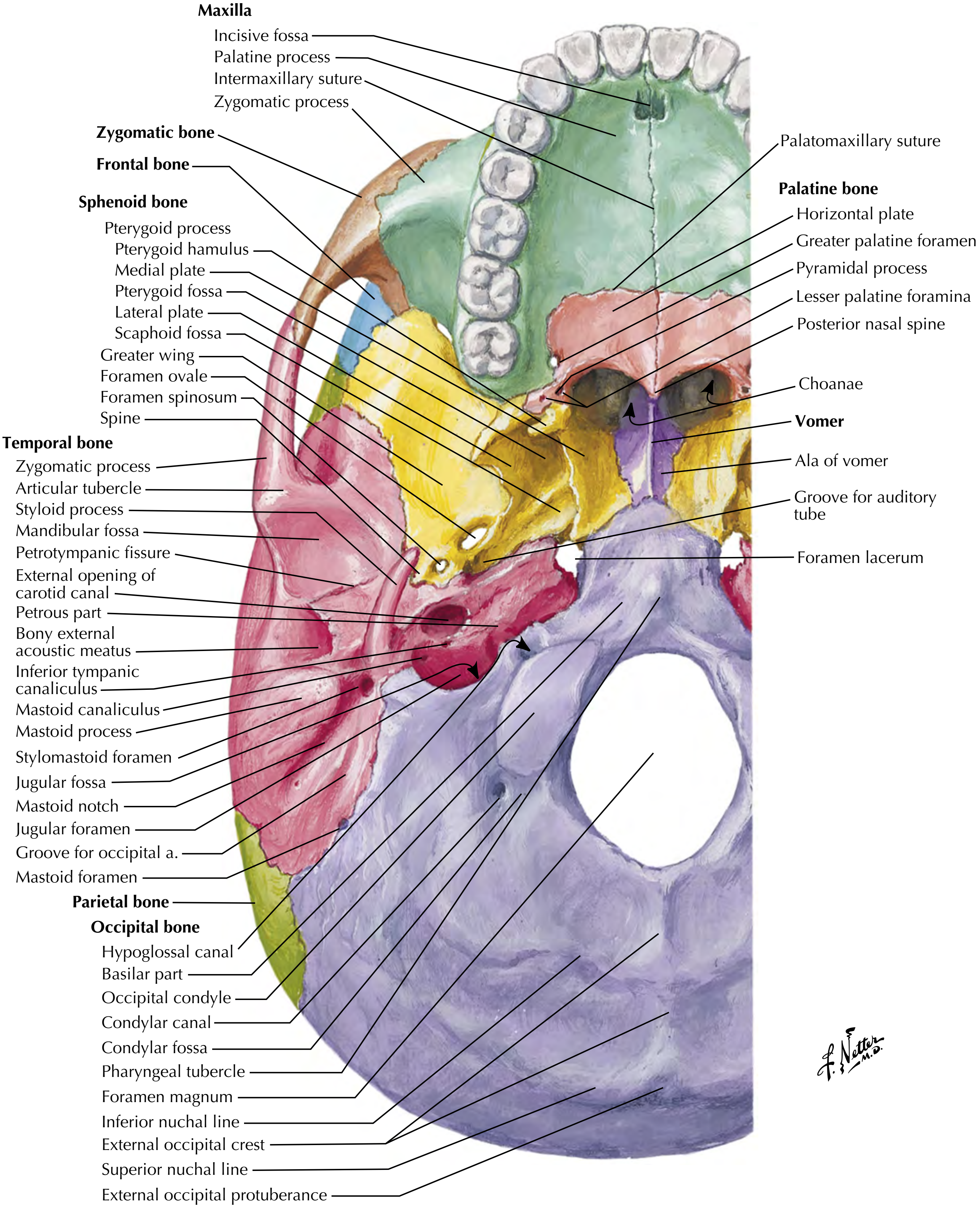

Nasal bone
Frontal bone
Ethmoid bone
Cribriform plate
Bony superior nasal concha
Bony middle nasal concha
Lacrimal bone
Inferior nasal concha bone
Maxilla
Nasal surface
Palatine process
Alveolar process
Opening of sinus of sphenoid bone
Sphenopalatine foramen
Sphenoid bone
Body
Medial plate
Lateral plate
Pterygoid process
Pterygoid hamulus
Palatine bone
Perpendicular plate
Horizontal plate

View of lateral nasal wall with nasal septum removed

Calvaria

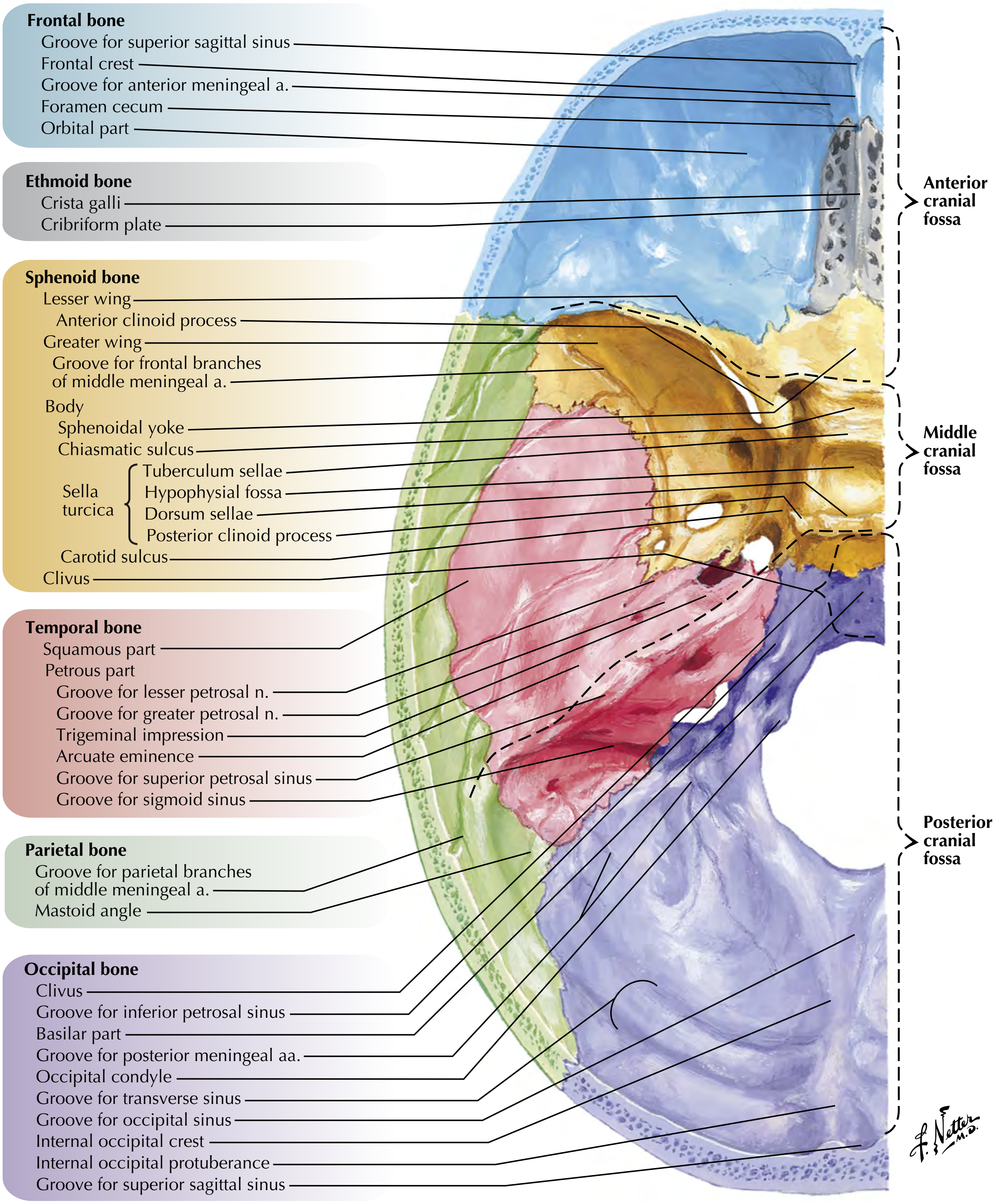
See also **Plates 127, 128**


Superior view
Frontal bone
Coronal suture
Bregma
Parietal bone
Sagittal suture
Parietal foramen
Lambda
Lambdoid suture
Sutural bone (Wormian)
Occipital bone
Inferior view
Frontal bone
Frontal crest
Groove for superior sagittal sinus
Coronal suture
Parietal bone
Granular foveolae
Diploë
Grooves for branches of middle meningeal a.
Groove for superior sagittal sinus
Sagittal suture
Lambdoid suture
Occipital bone


Maxilla
Incisive fossa
Palatine process
Intermaxillary suture
Zygomatic process
Zygomatic bone
Frontal bone
Sphenoid bone
Pterygoid process
Pterygoid hamulus
Medial plate
Pterygoid fossa
Lateral plate
Scaphoid fossa
Greater wing
Foramen ovale
Foramen spinosum
Spine
Temporal bone
Zygomatic process
Articular tubercle
Styloid process
Mandibular fossa
Petrotympanic fissure
External opening of carotid canal
Petrous part
Bony external acoustic meatus
Inferior tympanic canaliculus
Mastoid canaliculus
Mastoid process
Stylomastoid foramen
Jugular fossa
Mastoid notch
Jugular foramen
Groove for occipital a.
Mastoid foramen
Parietal bone
Occipital bone
Hypoglossal canal
Basilar part
Occipital condyle
Condylar canal
Condylar fossa
Pharyngeal tubercle
Foramen magnum
Inferior nuchal line
External occipital crest
Superior nuchal line
External occipital protuberance
Palatomaxillary suture
Palatine bone
Horizontal plate
Greater palatine foramen
Pyramidal process
Lesser palatine foramina
Posterior nasal spine
Choanae
Vomer
Ala of vomer
Groove for auditory tube
Foramen lacerum

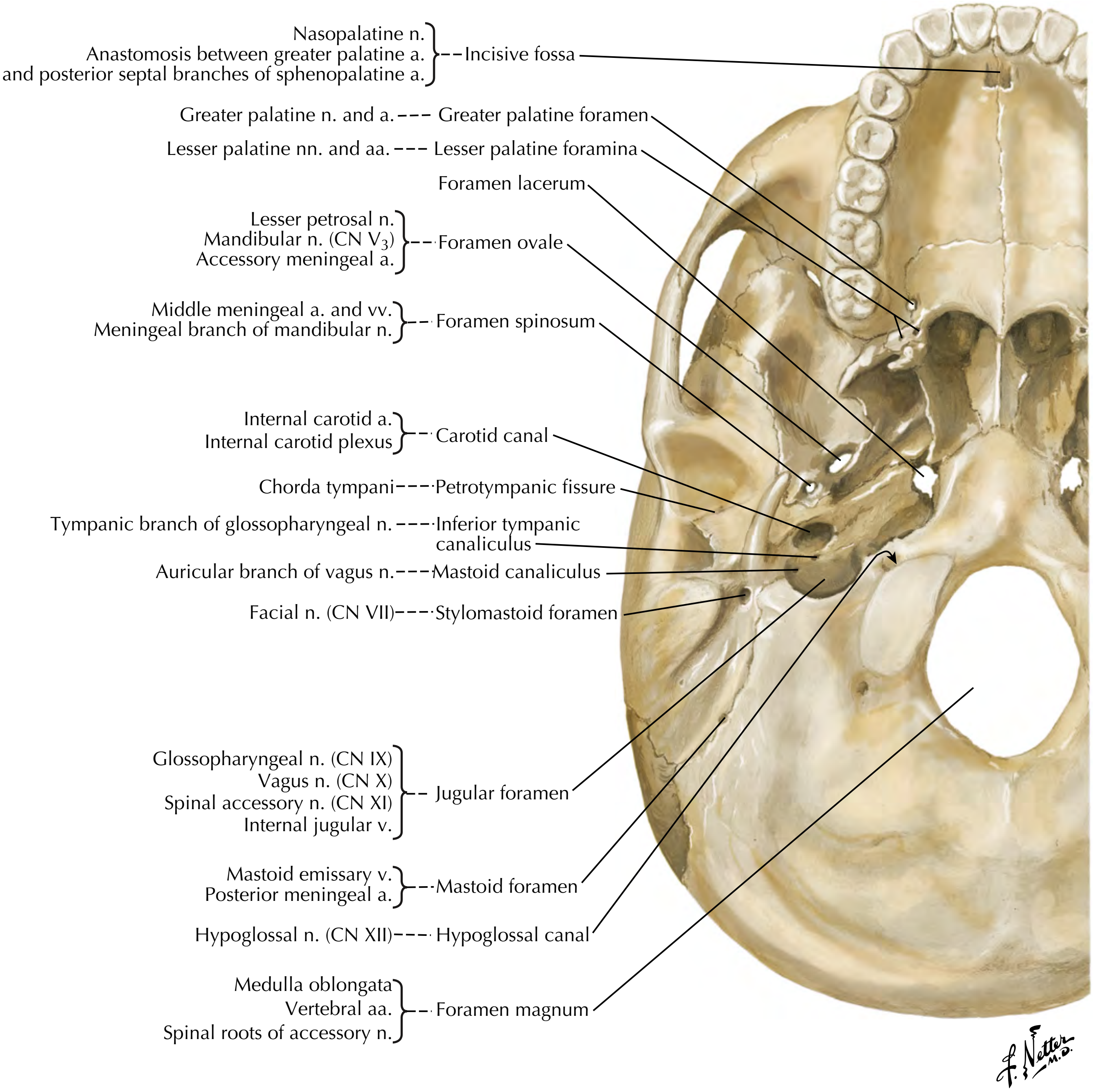
Cranial Base: Superior View

See also **Plates 34, 131**


Frontal bone
Groove for superior sagittal sinus
Frontal crest
Groove for anterior meningeal a.
Foramen cecum
Orbital part
Ethmoid bone
Crista galli
Cribriform plate
Sphenoid bone
Lesser wing
Anterior clinoid process
Greater wing
Groove for frontal branches of middle meningeal a.
Body
Sphenoidal yoke
Chiasmatic sulcus
Sella turcica
Tuberculum sellae
Hypophysial fossa
Dorsum sellae
Posterior clinoid process
Carotid sulcus
Clivus
Temporal bone
Squamous part
Petrous part
Groove for lesser petrosal n.
Groove for greater petrosal n.
Trigeminal impression
Arcuate eminence
Groove for superior petrosal sinus
Groove for sigmoid sinus
Parietal bone
Groove for parietal branches of middle meningeal a.
Mastoid angle
Occipital bone
Clivus
Groove for inferior petrosal sinus
Basilar part
Groove for posterior meningeal aa.
Occipital condyle
Groove for transverse sinus
Groove for occipital sinus
Internal occipital crest
Internal occipital protuberance
Groove for superior sagittal sinus
Anterior cranial fossa
Middle cranial fossa
Posterior cranial fossa
F. Netter M.D.

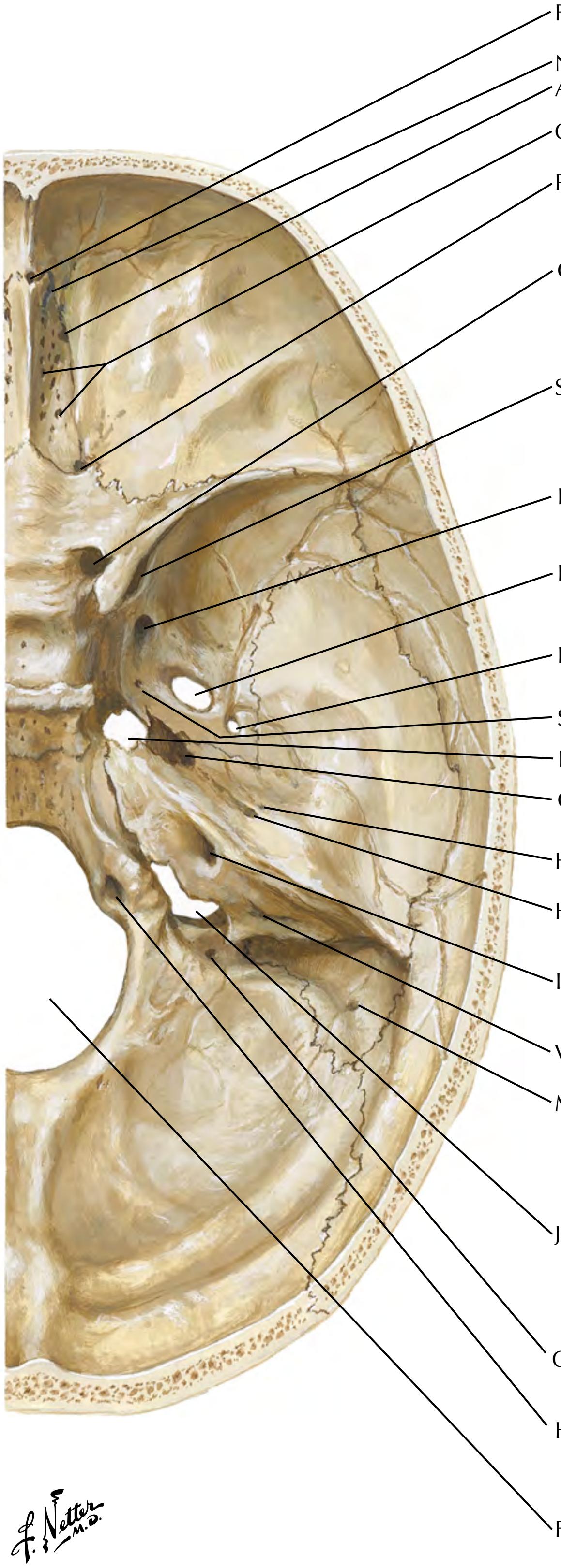
Foramina and Canals of Cranial Base: Inferior View

See also **Plate 31**


Nasopalatine n.
Anastomosis between greater palatine a. and posterior septal branches of sphenopalatine a.
Incisive fossa
Greater palatine n. and a.
Greater palatine foramen
Lesser palatine nn. and aa.
Lesser palatine foramina
Foramen lacerum
Lesser petrosal n.
Mandibular n. (CN V_3)
Accessory meningeal a.
Foramen ovale
Middle meningeal a. and vv.
Meningeal branch of mandibular n.
Foramen spinosum
Internal carotid a.
Internal carotid plexus
Carotid canal
Chorda tympani
Petrotympanic fissure
Tympanic branch of glossopharyngeal n.
Inferior tympanic canaliculus
Auricular branch of vagus n.
Mastoid canaliculus
Facial n. (CN VII)
Stylomastoid foramen
Glossopharyngeal n. (CN IX)
Vagus n. (CN X)
Spinal accessory n. (CN XI)
Internal jugular v.
Jugular foramen
Mastoid emissary v.
Posterior meningeal a.
Mastoid foramen
Hypoglossal n. (CN XII)
Hypoglossal canal
Medulla oblongata
Vertebral aa.
Spinal roots of accessory n.
Foramen magnum
F. Netter M.D.

Foramina and Canals of Cranial Base: Superior View

See also **Plates 32, 131**

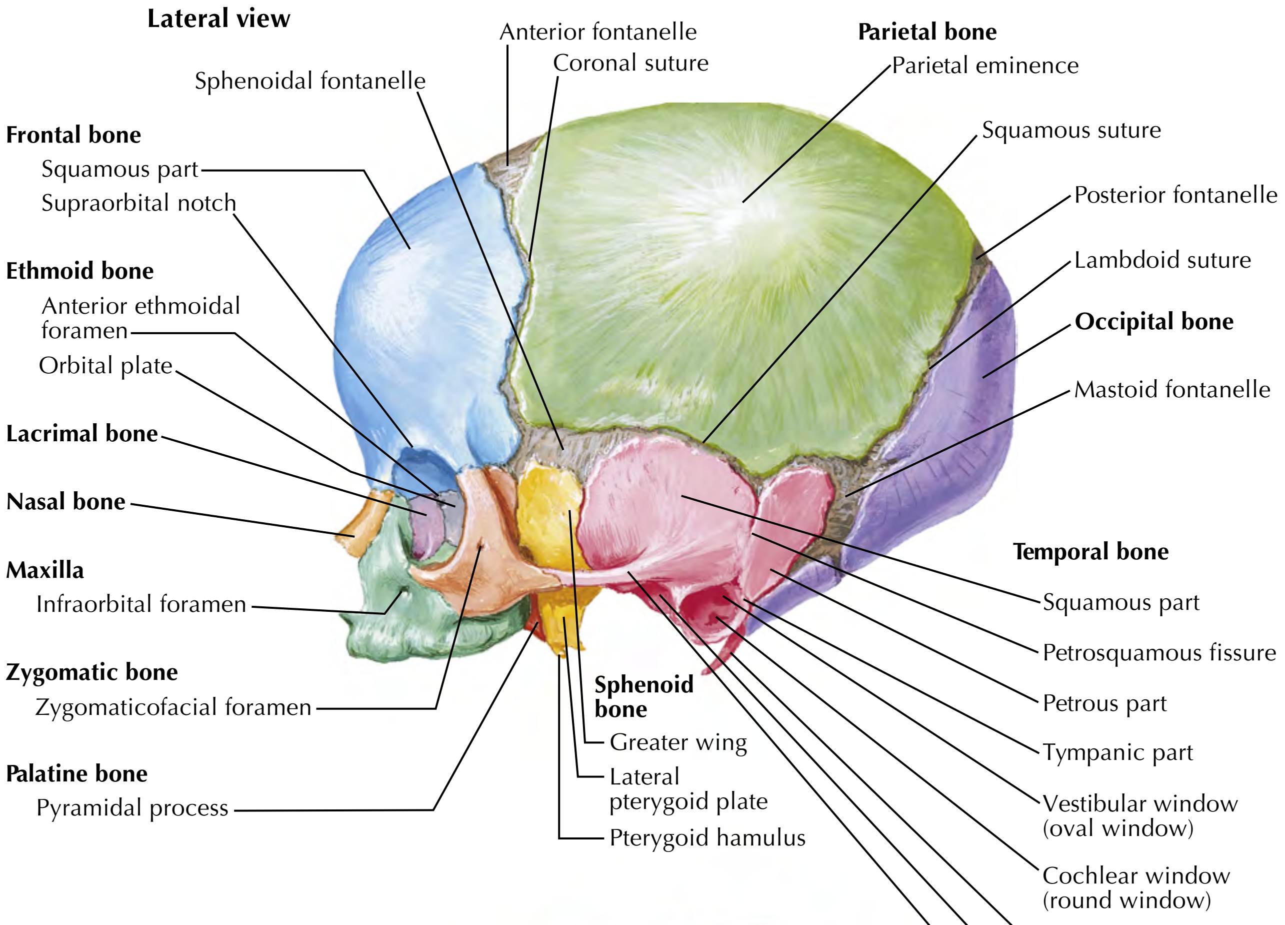


Foramen cecum	Emissary v. to superior sagittal sinus
Nasal fissure Anterior ethmoidal foramen	Anterior ethmoidal a. and v. Anterior ethmoidal n.
Cribriform foramina	Olfactory n. (CN I)
Posterior ethmoidal foramen	Posterior ethmoidal a. and v. Posterior ethmoidal n.
Optic canal	Optic n. (CN II) Ophthalmic a.
Superior orbital fissure	Oculomotor n. (CN III) Trochlear n. (CN IV) Ophthalmic n. (CN V_1) Abducens n. (CN VI) Superior ophthalmic v.
Foramen rotundum	Maxillary n. (CN V_2)
Foramen ovale	Mandibular n. (CN V_3) Accessory meningeal a. Lesser petrosal n.
Foramen spinosum	Middle meningeal a. and vv. Meningeal branch of mandibular n.
Sphenoidal emissary foramen (of Vesalius) (inconstant)	Emissary v.
Foramen lacerum	
Carotid canal	Internal carotid a. Internal carotid plexus
Hiatus for	Lesser petrosal n.
Hiatus for	Greater petrosal n.
Internal acoustic meatus	Facial n. (CN VII) Vestibulocochlear n. (CN VIII) Labyrinthine a.
Vestibular canaliculus	Endolymphatic duct
Mastoid foramen	Mastoid emissary v.
Jugular foramen	Inferior petrosal sinus Glossopharyngeal n. (CN IX) Vagus n. (CN X) Spinal accessory n. (CN XI) Sigmoid sinus Posterior meningeal a.
Condylar canal	Condylar emissary v. Meningeal branch of ascending pharyngeal a.
Hypoglossal canal	Hypoglossal n. (CN XII)
Foramen magnum	Medulla oblongata Vertebral aa. Meningeal branches of vertebral aa. Spinal roots of accessory n.

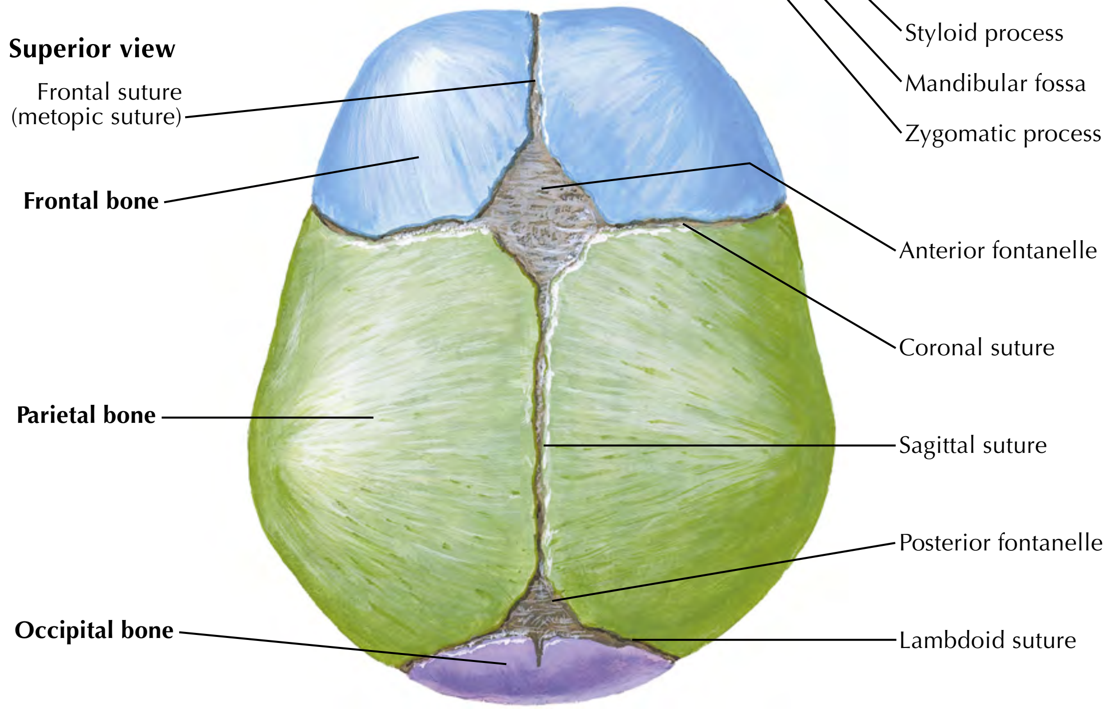
Cranium of Newborn

See also **Plates 27, 30, BP 16**

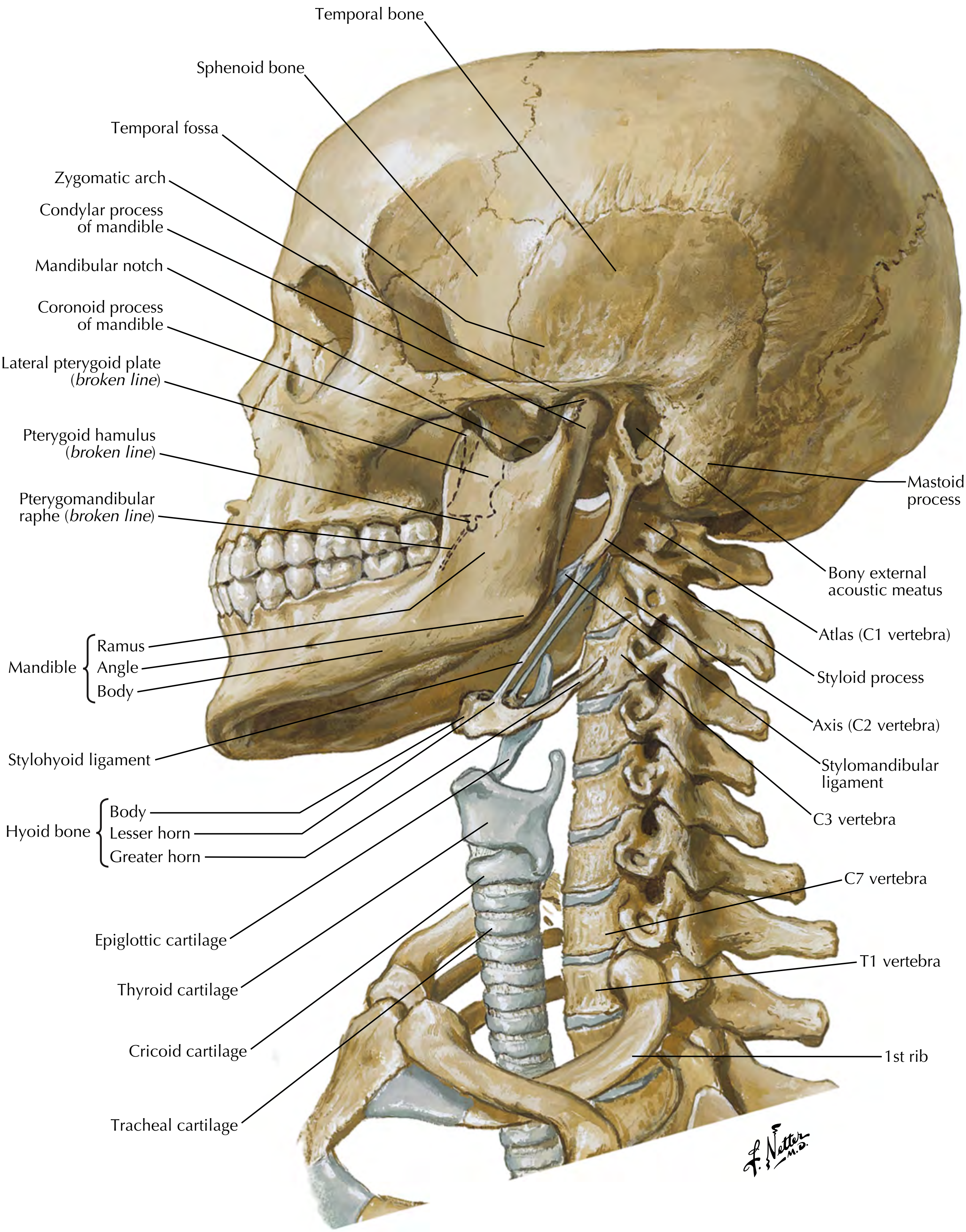
Lateral view


Sphenoidal fontanelle
Anterior fontanelle
Coronal suture
Parietal bone
Parietal eminence
Squamous suture
Posterior fontanelle
Lambdoid suture
Occipital bone
Mastoid fontanelle
Frontal bone
Squamous part
Supraorbital notch
Ethmoid bone
Anterior ethmoidal foramen
Orbital plate
Lacrimal bone
Nasal bone
Maxilla
Infraorbital foramen
Zygomatic bone
Zygomaticofacial foramen
Palatine bone
Pyramidal process
Sphenoid bone
Greater wing
Lateral pterygoid plate
Pterygoid hamulus
Temporal bone
Squamous part
Petrosquamous fissure
Petrous part
Tympanic part
Vestibular window (oval window)
Cochlear window (round window)
Styloid process
Mandibular fossa
Zygomatic process

Superior view

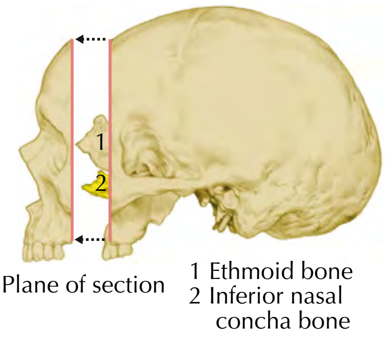

Frontal suture (metopic suture)
Frontal bone
Anterior fontanelle
Coronal suture
Parietal bone
Sagittal suture
Posterior fontanelle
Occipital bone
Lambdoid suture

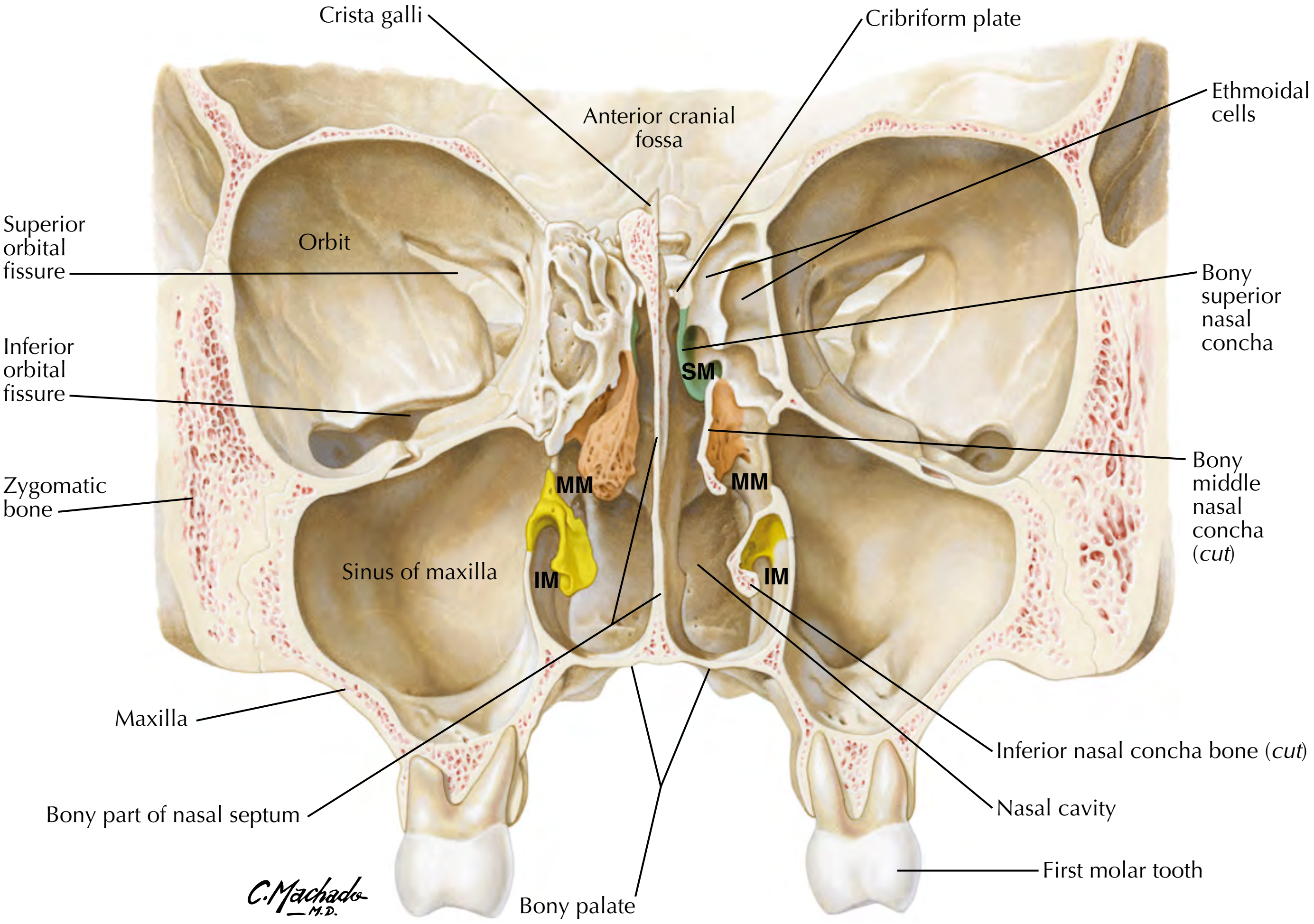
See also **Plates 27, 43, BP 18, BP 35**


Temporal bone
Sphenoid bone
Temporal fossa
Zygomatic arch
Condylar process of mandible
Mandibular notch
Coronoid process of mandible
Lateral pterygoid plate (*broken line*)
Pterygoid hamulus (*broken line*)
Pterygomandibular raphe (*broken line*)
Mandible
Ramus
Angle
Body
Stylohyoid ligament
Hyoid bone
Body
Lesser horn
Greater horn
Epiglottic cartilage
Thyroid cartilage
Cricoid cartilage
Tracheal cartilage
Mastoid process
Bony external acoustic meatus
Atlas (C1 vertebra)
Styloid process
Axis (C2 vertebra)
Stylomandibular ligament
C3 vertebra
C7 vertebra
T1 vertebra
1st rib
F. Netter M.D.

Nasal Skeleton and Paranasal Sinuses

See also **Plates 62, 69, BP 22**


1
2
Plane of section
1 Ethmoid bone
2 Inferior nasal concha bone


Crista galli
Cribriform plate
Anterior cranial fossa
Ethmoidal cells
Superior orbital fissure
Orbit
Bony superior nasal concha
SM
Inferior orbital fissure
Bony middle nasal concha (*cut*)
MM
MM
Zygomatic bone
Sinus of maxilla
IM
IM
Maxilla
Inferior nasal concha bone (*cut*)
Nasal cavity
Bony part of nasal septum
First molar tooth
Bony palate

🟩 Bony superior nasal concha

🟧 Bony middle nasal concha

🟨 Inferior nasal concha bone

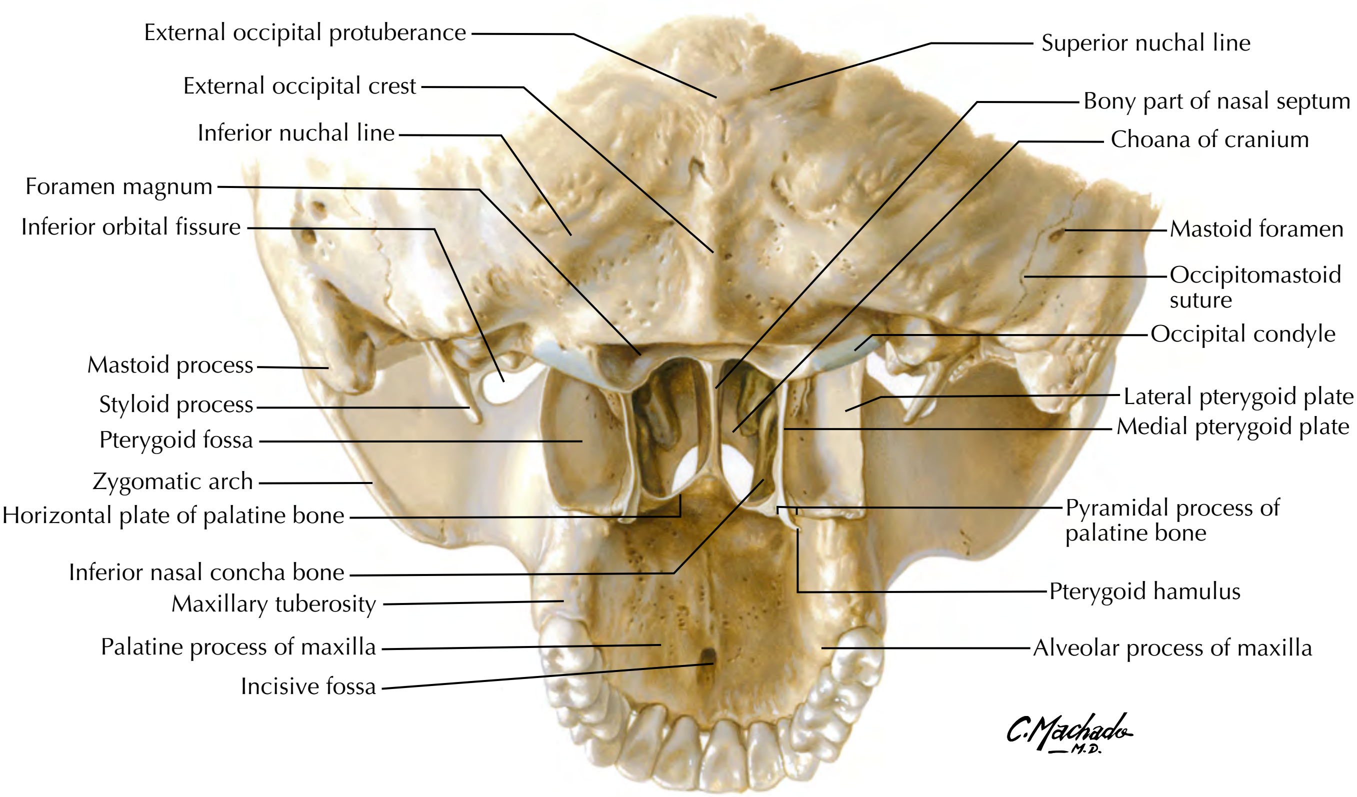
SM Superior nasal meatus

MM Middle nasal meatus

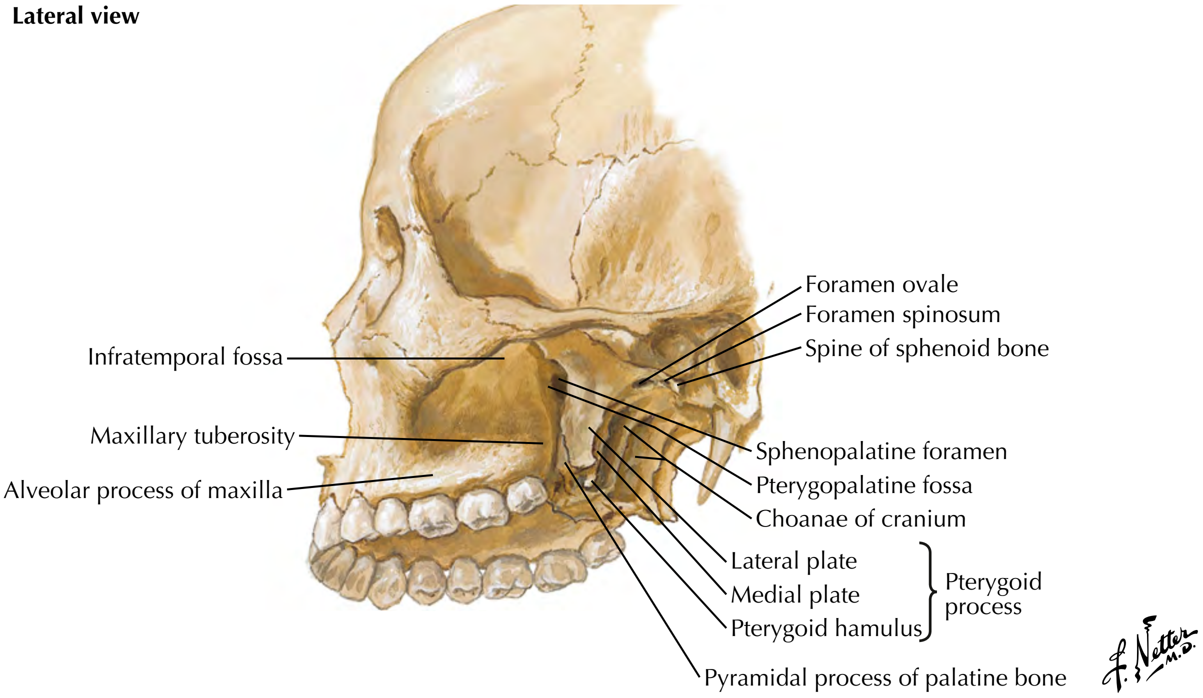
IM Inferior nasal meatus

See also **Plates 64, 66, BP 21**

Posterior view

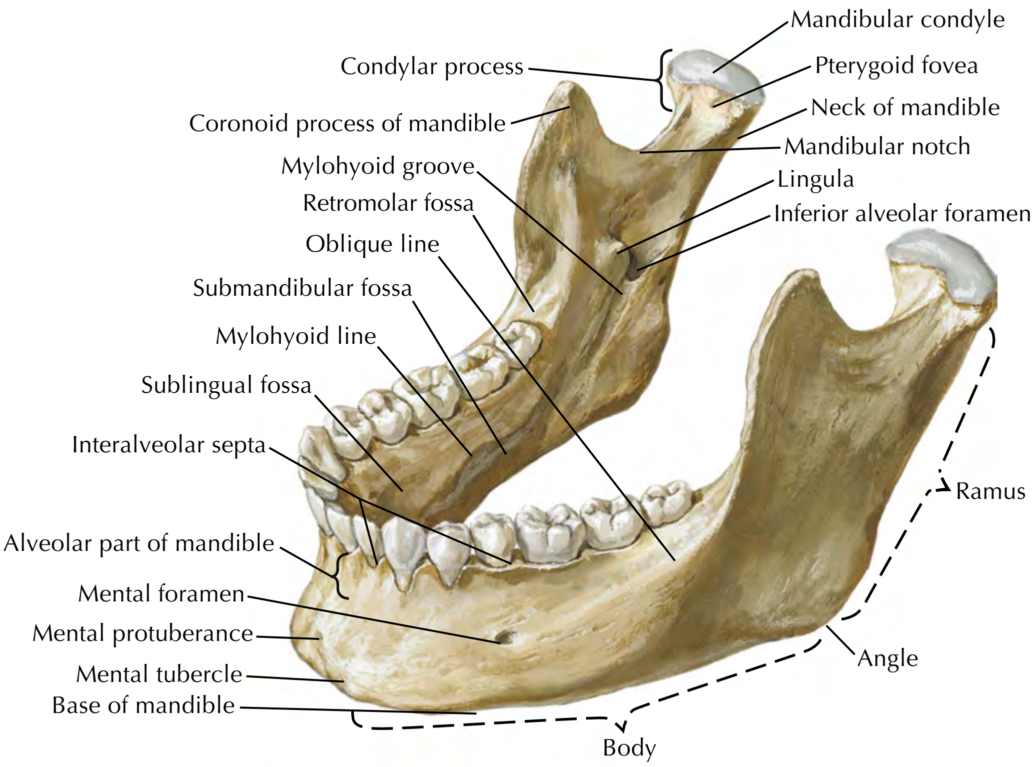

External occipital protuberance
External occipital crest
Inferior nuchal line
Foramen magnum
Inferior orbital fissure
Mastoid process
Styloid process
Pterygoid fossa
Zygomatic arch
Horizontal plate of palatine bone
Inferior nasal concha bone
Maxillary tuberosity
Palatine process of maxilla
Incisive fossa
Superior nuchal line
Bony part of nasal septum
Choana of cranium
Mastoid foramen
Occipitomastoid suture
Occipital condyle
Lateral pterygoid plate
Medial pterygoid plate
Pyramidal process of palatine bone
Pterygoid hamulus
Alveolar process of maxilla
C. Machado M.D.

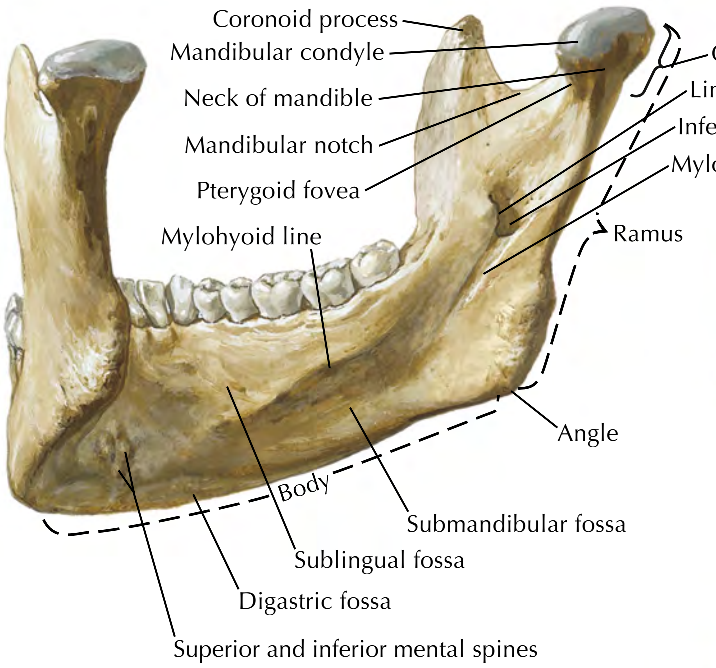
Lateral view

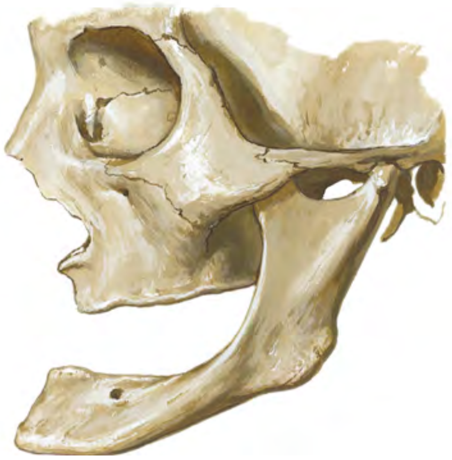

Infratemporal fossa
Maxillary tuberosity
Alveolar process of maxilla
Foramen ovale
Foramen spinosum
Spine of sphenoid bone
Sphenopalatine foramen
Pterygopalatine fossa
Choanae of cranium
Lateral plate
Medial plate
Pterygoid hamulus
Pterygoid process
Pyramidal process of palatine bone
F. Netter M.D.

Mandible

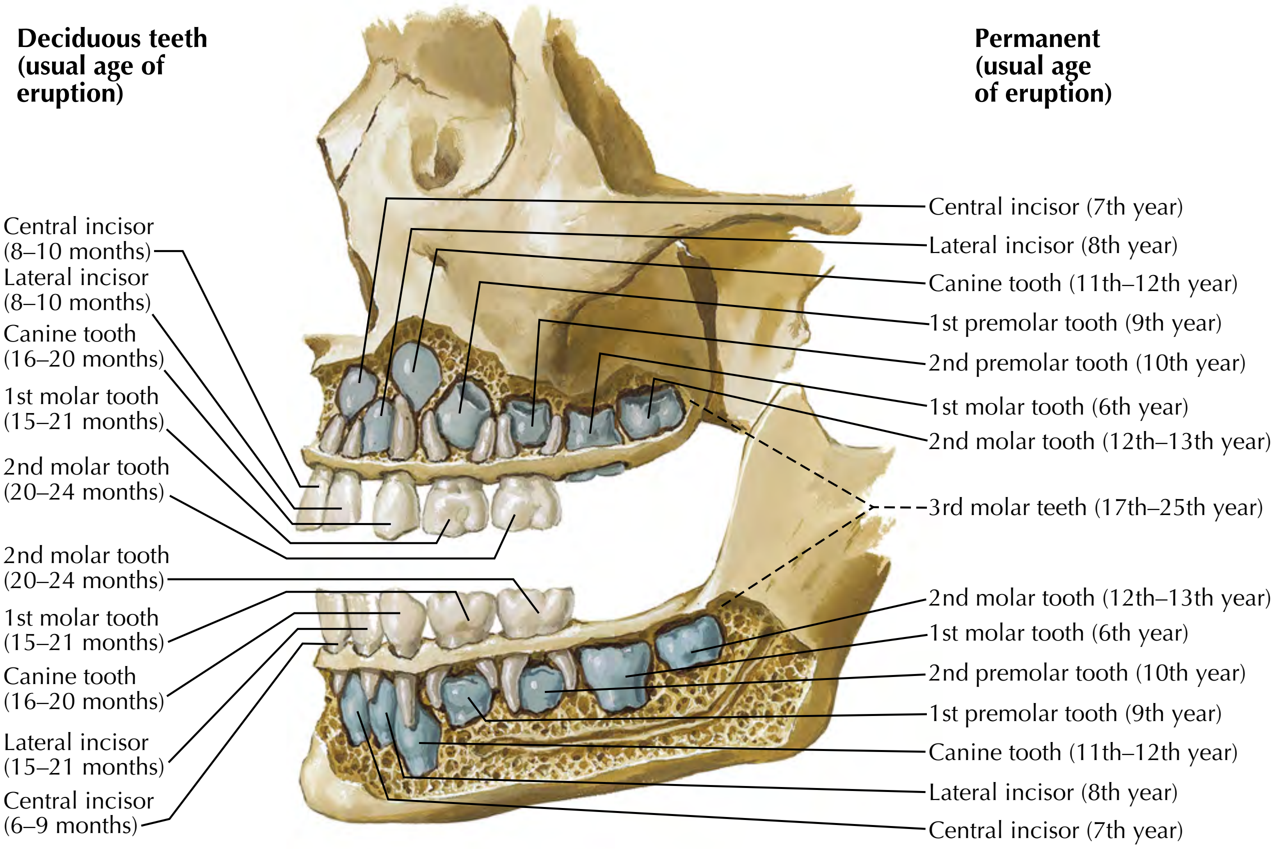
See also **Plates 72, 73**

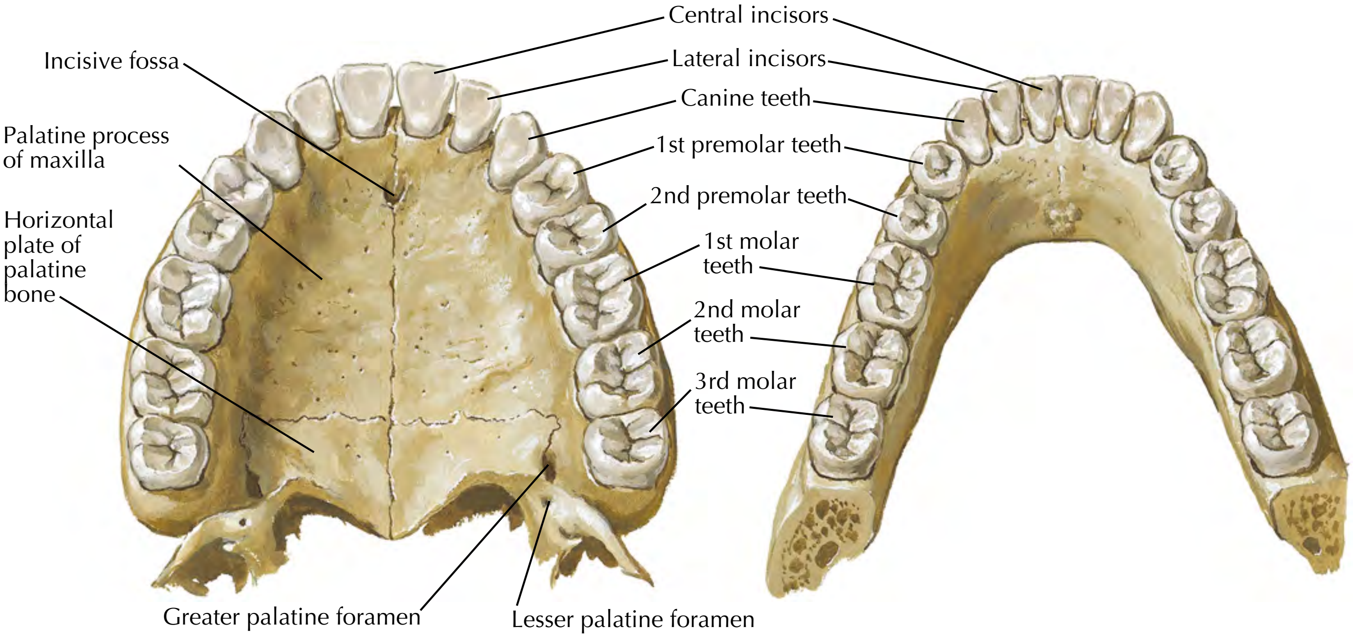

Mandibular condyle
Condylar process
Pterygoid fovea
Neck of mandible
Coronoid process of mandible
Mandibular notch
Mylohyoid groove
Lingula
Retromolar fossa
Inferior alveolar foramen
Oblique line
Submandibular fossa
Mylohyoid line
Sublingual fossa
Interalveolar septa
Ramus
Alveolar part of mandible
Mental foramen
Mental protuberance
Angle
Mental tubercle
Base of mandible
Body


Coronoid process
Mandibular condyle
Condylar process
Lingula
Neck of mandible
Inferior alveolar foramen
Mandibular notch
Mylohyoid groove
Pterygoid fovea
Ramus
Mylohyoid line
Angle
Body
Submandibular fossa
Sublingual fossa
Digastric fossa
Superior and inferior mental spines



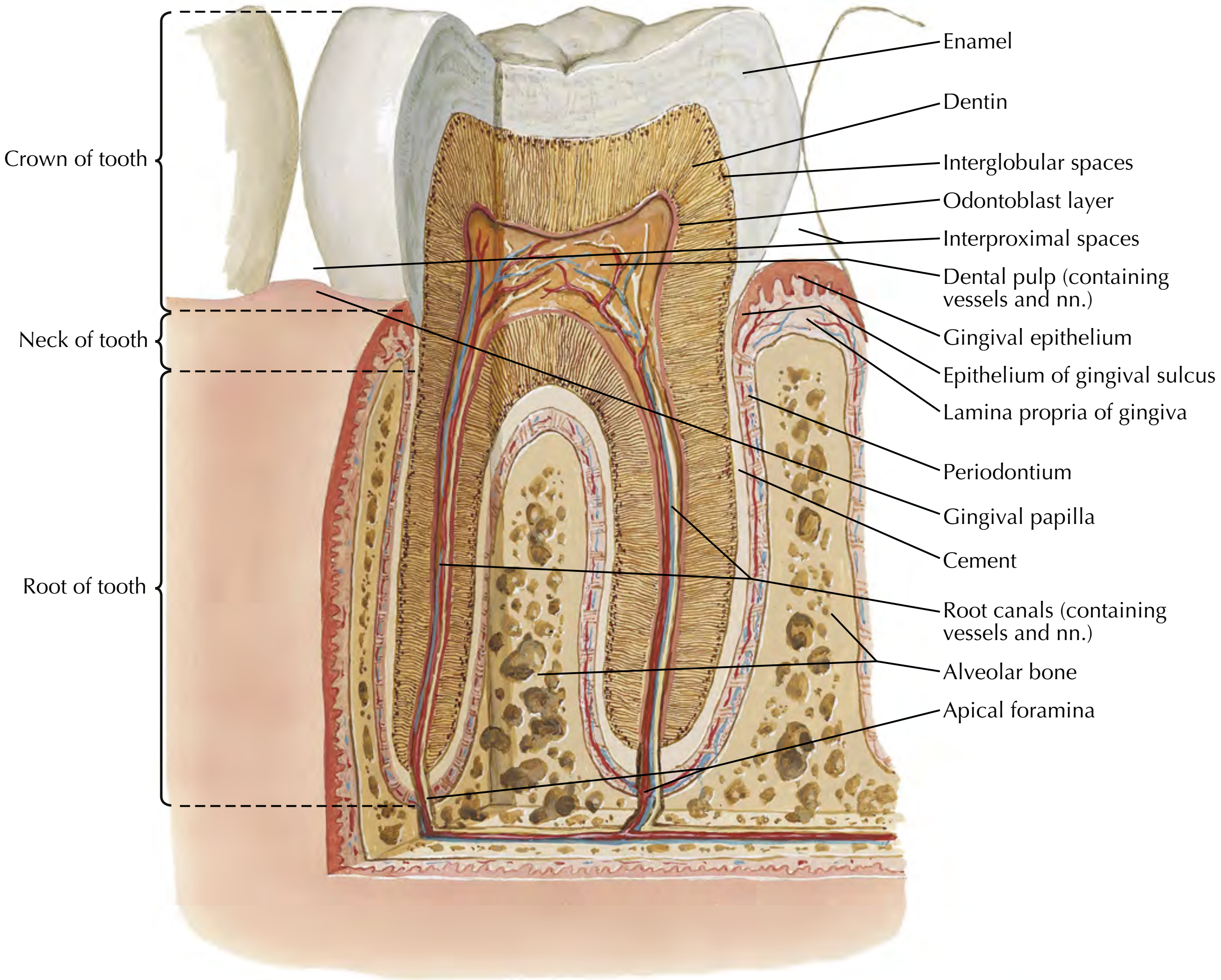
Mandible of aged, edentulous person

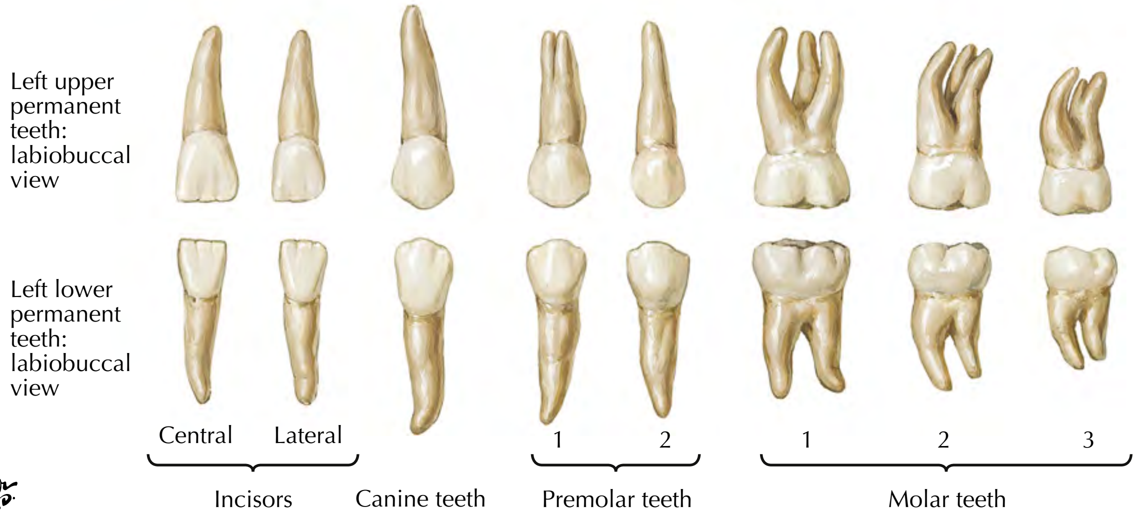

Deciduous teeth (usual age of eruption)
Permanent (usual age of eruption)
Central incisor (8–10 months)
Lateral incisor (8–10 months)
Canine tooth (16–20 months)
1st molar tooth (15–21 months)
2nd molar tooth (20–24 months)
2nd molar tooth (20–24 months)
1st molar tooth (15–21 months)
Canine tooth (16–20 months)
Lateral incisor (15–21 months)
Central incisor (6–9 months)
Central incisor (7th year)
Lateral incisor (8th year)
Canine tooth (11th–12th year)
1st premolar tooth (9th year)
2nd premolar tooth (10th year)
1st molar tooth (6th year)
2nd molar tooth (12th–13th year)
3rd molar teeth (17th–25th year)
2nd molar tooth (12th–13th year)
1st molar tooth (6th year)
2nd premolar tooth (10th year)
1st premolar tooth (9th year)
Canine tooth (11th–12th year)
Lateral incisor (8th year)
Central incisor (7th year)


Central incisors
Lateral incisors
Canine teeth
1st premolar teeth
2nd premolar teeth
1st molar teeth
2nd molar teeth
3rd molar teeth
Incisive fossa
Palatine process of maxilla
Horizontal plate of palatine bone
Greater palatine foramen
Lesser palatine foramen

Upper permanent teeth **Lower permanent teeth**

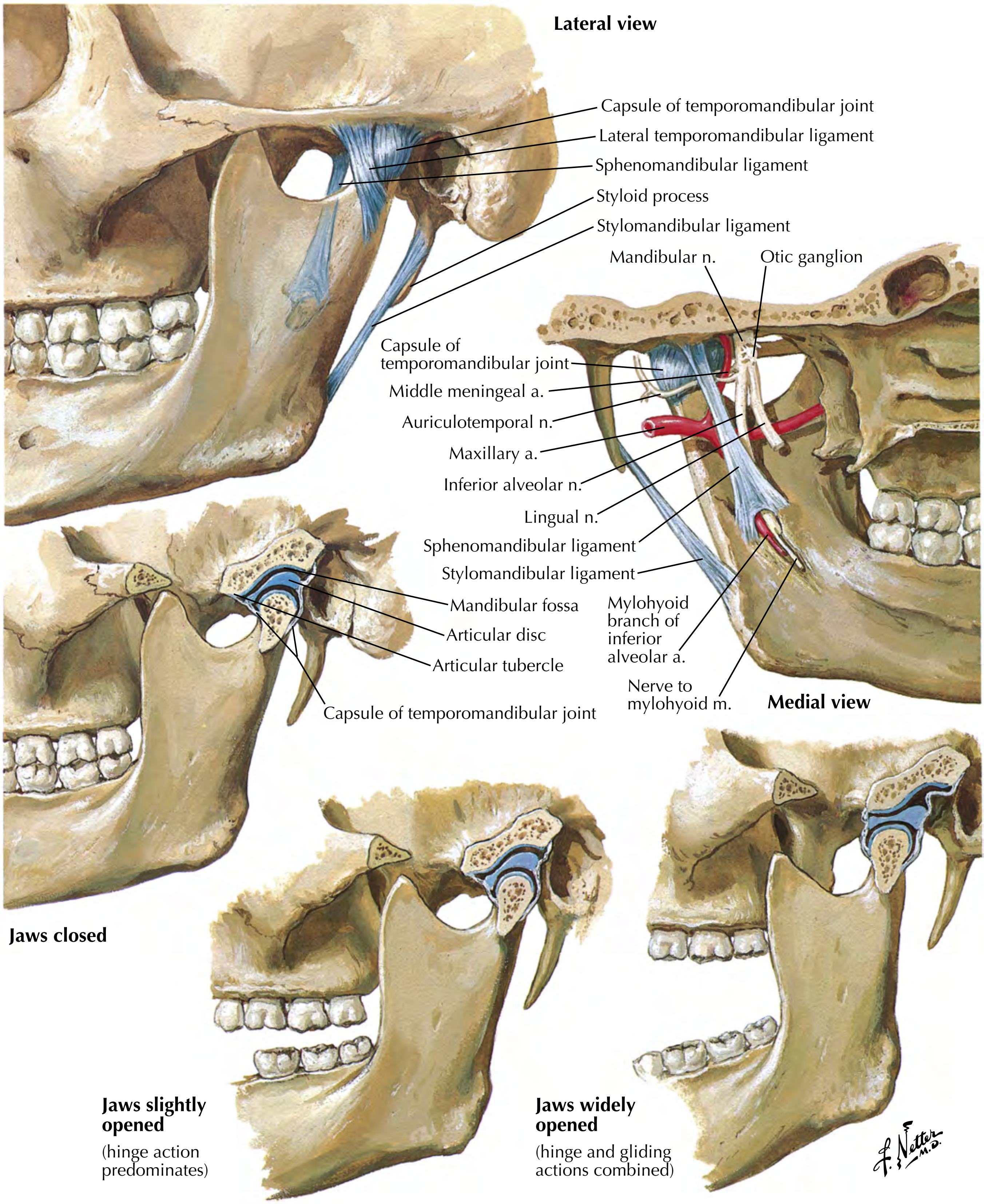
Tooth


Crown of tooth
Neck of tooth
Root of tooth
Enamel
Dentin
Interglobular spaces
Odontoblast layer
Interproximal spaces
Dental pulp (containing vessels and nn.)
Gingival epithelium
Epithelium of gingival sulcus
Lamina propria of gingiva
Periodontium
Gingival papilla
Cement
Root canals (containing vessels and nn.)
Alveolar bone
Apical foramina


Left upper permanent teeth: labiobuccal view
Left lower permanent teeth: labiobuccal view
Central
Lateral
Incisors
Canine teeth
1
2
Premolar teeth
1
2
3
Molar teeth

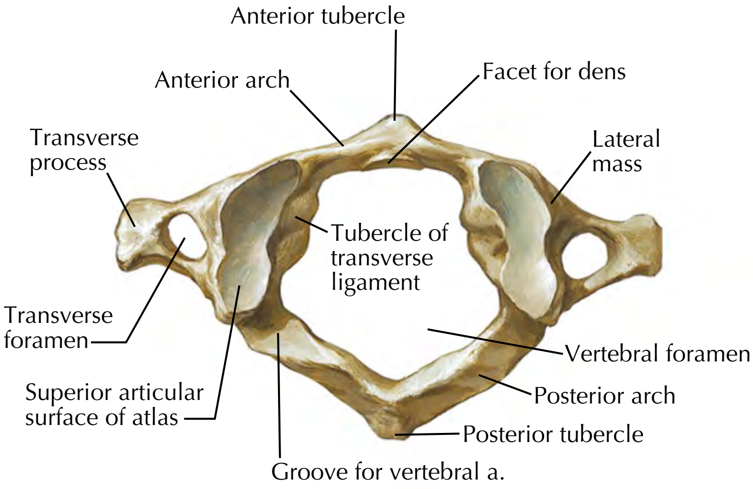
Temporomandibular Joint

See also **Plates 73, 76**

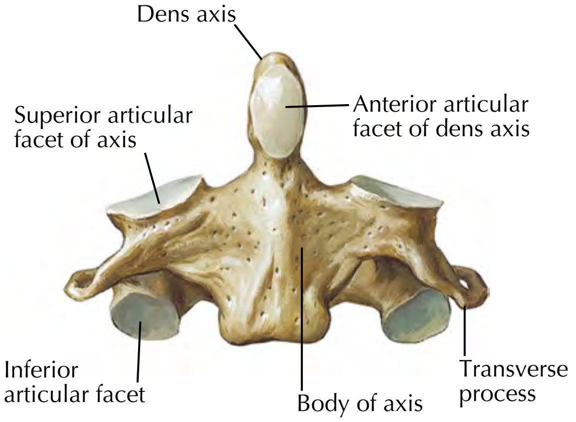

Lateral view
Capsule of temporomandibular joint
Lateral temporomandibular ligament
Sphenomandibular ligament
Styloid process
Stylomandibular ligament
Mandibular n.
Otic ganglion
Capsule of temporomandibular joint
Middle meningeal a.
Auriculotemporal n.
Maxillary a.
Inferior alveolar n.
Lingual n.
Sphenomandibular ligament
Stylomandibular ligament
Mylohyoid branch of inferior alveolar a.
Nerve to mylohyoid m.
Medial view
Mandibular fossa
Articular disc
Articular tubercle
Capsule of temporomandibular joint
Jaws closed
Jaws slightly opened
(hinge action predominates)
Jaws widely opened
(hinge and gliding actions combined)
F. Netter M.D.

Cervical Vertebrae: Atlas and Axis

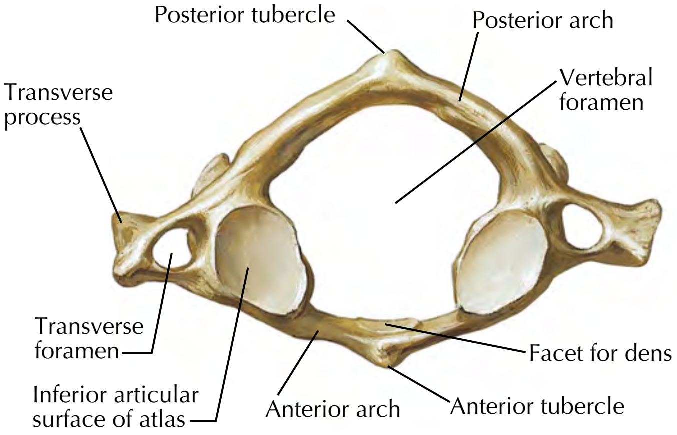
See also **Plates 45, 47, BP 18**


Anterior tubercle
Anterior arch
Facet for dens
Transverse process
Lateral mass
Tubercle of transverse ligament
Transverse foramen
Vertebral foramen
Superior articular surface of atlas
Posterior arch
Posterior tubercle
Groove for vertebral a.

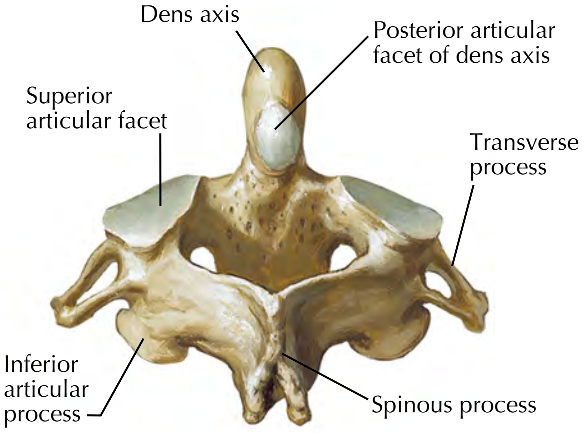
Atlas: superior view


Dens axis
Superior articular facet of axis
Anterior articular facet of dens axis
Inferior articular facet
Body of axis
Transverse process

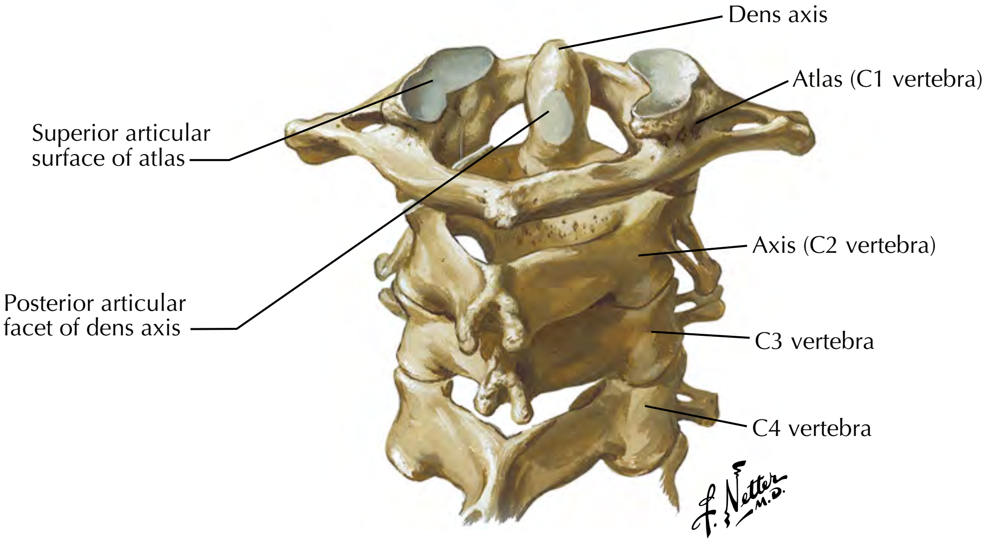
Axis: anterior view


Posterior tubercle
Posterior arch
Transverse process
Vertebral foramen
Transverse foramen
Facet for dens
Inferior articular surface of atlas
Anterior arch
Anterior tubercle

Atlas: inferior view

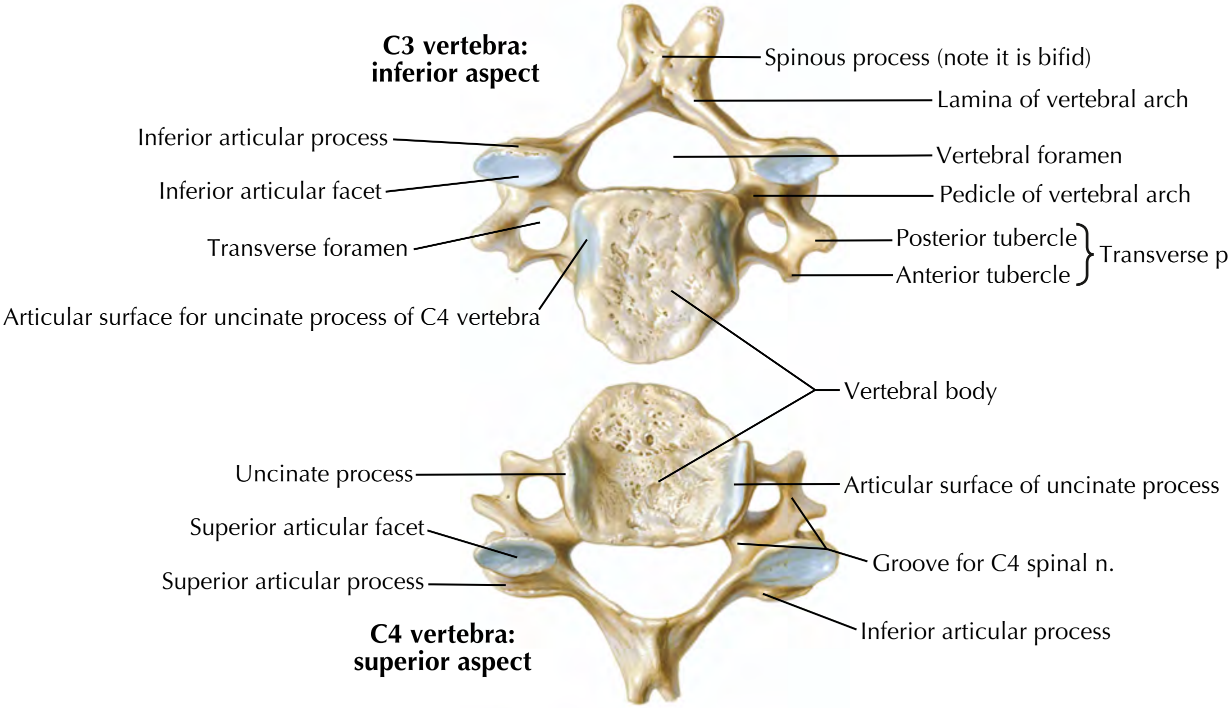

Dens axis
Posterior articular facet of dens axis
Superior articular facet
Transverse process
Inferior articular process
Spinous process

Axis: posterosuperior view

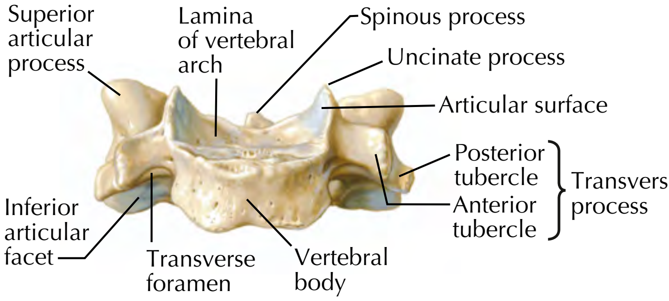

Dens axis
Atlas (C1 vertebra)
Superior articular surface of atlas
Axis (C2 vertebra)
Posterior articular facet of dens axis
C3 vertebra
C4 vertebra

Upper cervical vertebrae: posterosuperior view

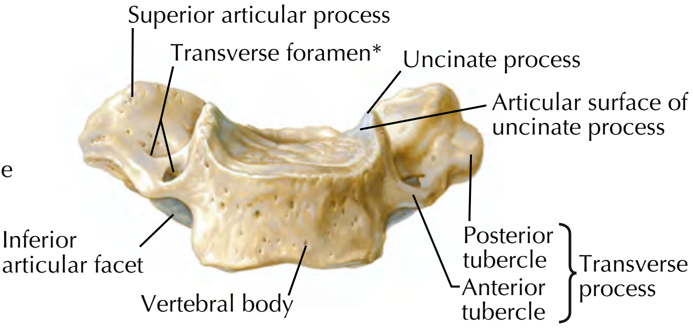
Inferior aspect of C3 vertebra and superior aspect of C4 vertebra showing the sites of the articular surfaces of the uncovertebral joints


C3 vertebra: inferior aspect
Spinous process (note it is bifid)
Lamina of vertebral arch
Inferior articular process
Vertebral foramen
Inferior articular facet
Pedicle of vertebral arch
Transverse foramen
Posterior tubercle
Anterior tubercle
Transverse process
Articular surface for uncinate process of C4 vertebra
Vertebral body
Uncinate process
Articular surface of uncinate process
Superior articular facet
Groove for C4 spinal n.
Superior articular process
Inferior articular process
C4 vertebra: superior aspect

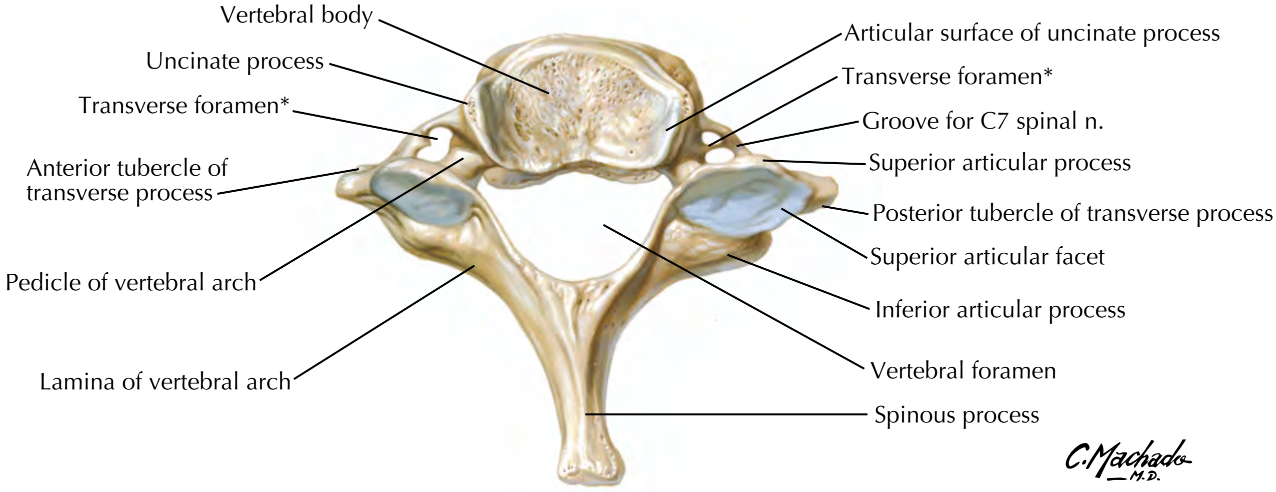
C4 vertebra: anterior view


Superior articular process
Lamina of vertebral arch
Spinous process
Uncinate process
Articular surface
Posterior tubercle
Anterior tubercle
Transverse process
Inferior articular facet
Transverse foramen
Vertebral body

C7 vertebra: anterior view


Superior articular process
Transverse foramen*
Uncinate process
Articular surface of uncinate process
Inferior articular facet
Posterior tubercle
Anterior tubercle
Transverse process
Vertebral body

C7 vertebra (vertebra prominens): superior view


Vertebral body
Uncinate process
Transverse foramen*
Anterior tubercle of transverse process
Pedicle of vertebral arch
Lamina of vertebral arch
Articular surface of uncinate process
Transverse foramen*
Groove for C7 spinal n.
Superior articular process
Posterior tubercle of transverse process
Superior articular facet
Inferior articular process
Vertebral foramen
Spinous process

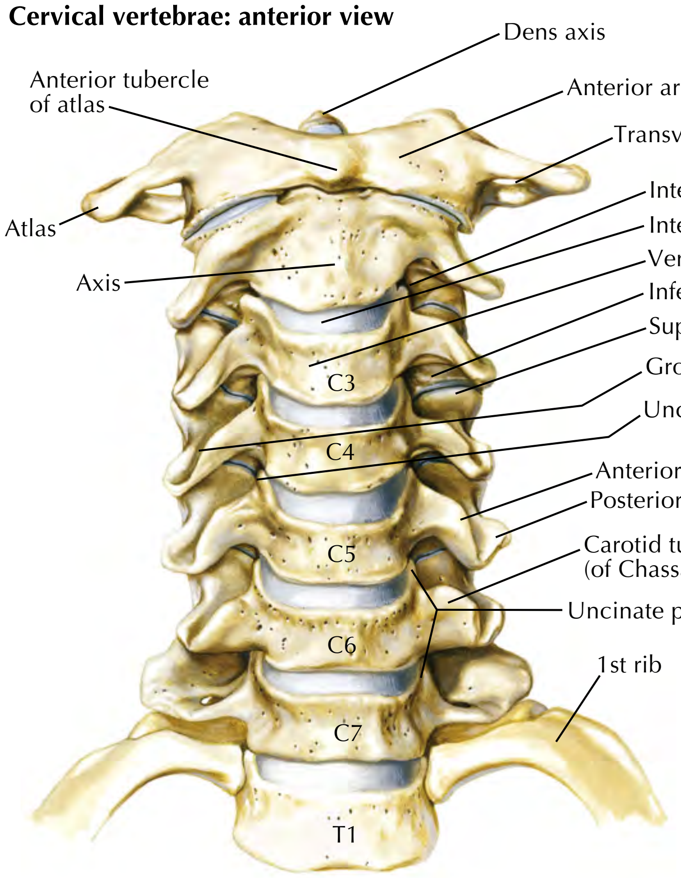
C.Machado M.D.

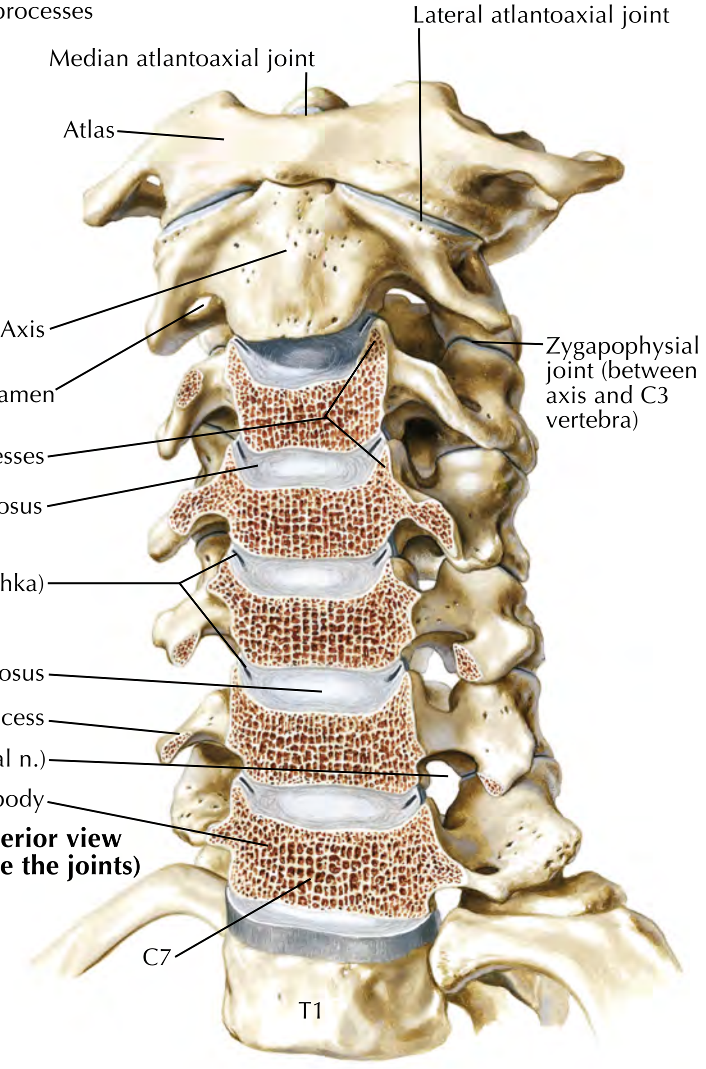
The transverse foramina of C7 transmit vertebral veins, but usually not the vertebral artery, and are asymmetrical in these drawings. Note the right transverse foramen is septated.

Cervical Part of Spinal Column

See also **Plates 46, BP 17, BP 18**

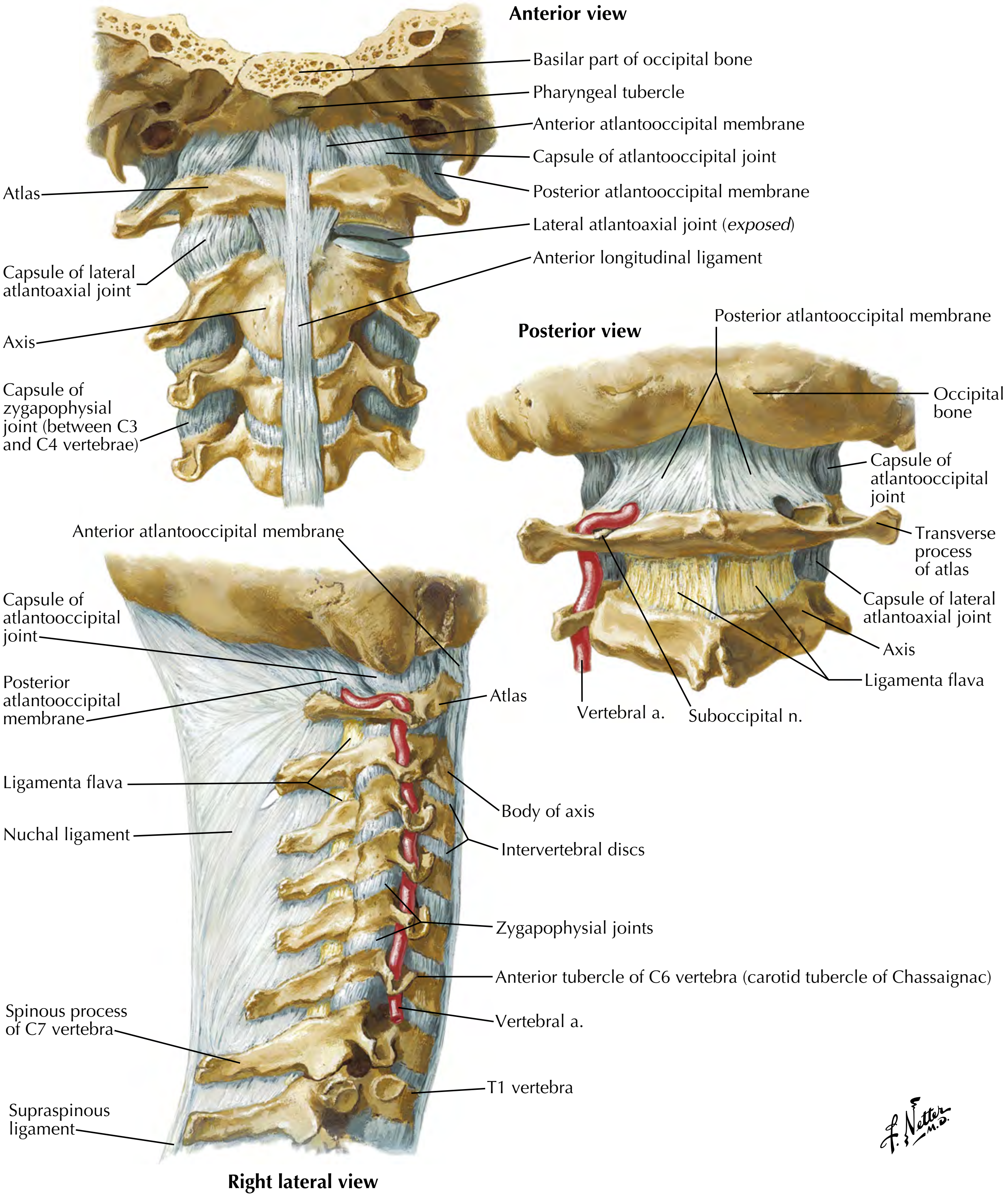
Cervical vertebrae: anterior view


Dens axis
Anterior tubercle of atlas
Anterior arch of atlas
Transverse foramen
Atlas
Intervertebral foramen (for C3 spinal n.)
Intervertebral disc
Axis
Vertebral body
Inferior articular process (of C3 vertebra)
Superior articular process (of C4 vertebra)
C3
Groove for spinal n.
Uncinate process
C4
Anterior tubercle
Posterior tubercle
Transverse process
C5
Carotid tubercle (of Chassaignac)
Uncinate processes
C6
1st rib
C7
T1


Lateral atlantoaxial joint
Median atlantoaxial joint
Atlas
Axis
Zygapophysial joint (between axis and C3 vertebra)
Transverse foramen
Uncinate processes
Anulus fibrosus
Uncovertebral joints (clefts of Luschka)
Nucleus pulposus
Transverse process
Intervertebral foramen (for C7 spinal n.)
Vertebral body
C7
T1

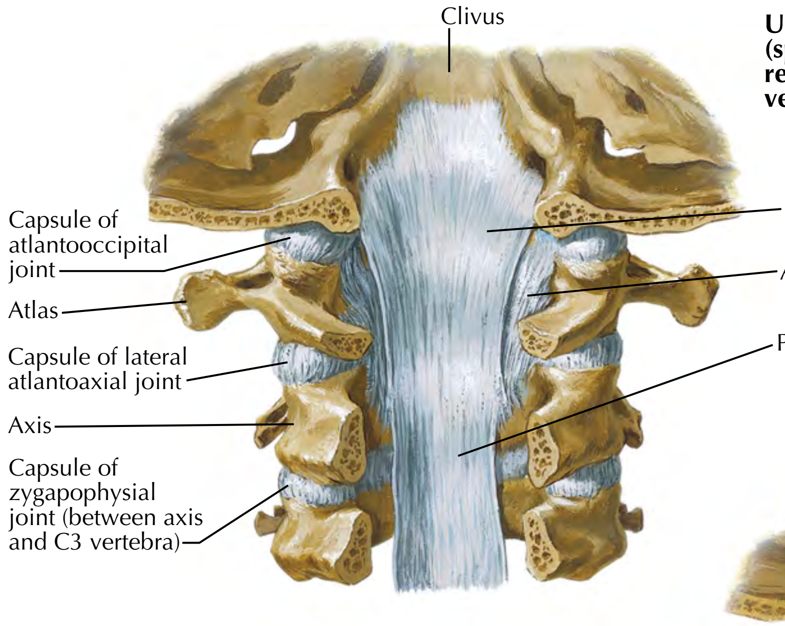
The uncovertebral joints of the cervical spine: anterior view (C3 to C7 have been sectioned coronally to expose the joints)

C. Machado M.D.

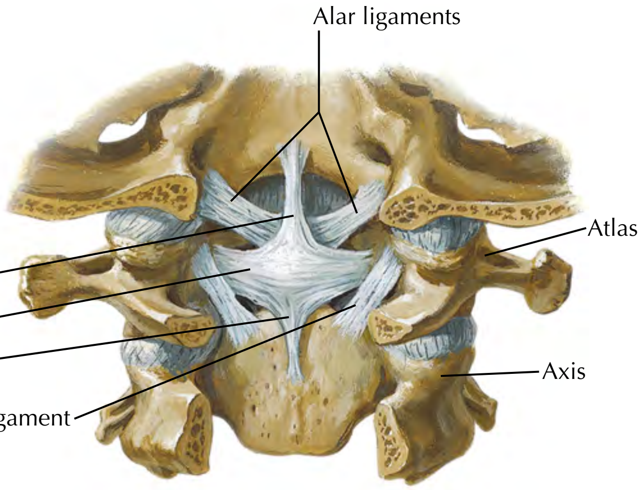

Anterior view
Basilar part of occipital bone
Pharyngeal tubercle
Anterior atlantooccipital membrane
Capsule of atlantooccipital joint
Posterior atlantooccipital membrane
Lateral atlantoaxial joint (*exposed*)
Anterior longitudinal ligament
Atlas
Capsule of lateral atlantoaxial joint
Axis
Capsule of zygapophysial joint (between C3 and C4 vertebrae)
Posterior view
Posterior atlantooccipital membrane
Occipital bone
Capsule of atlantooccipital joint
Transverse process of atlas
Capsule of lateral atlantoaxial joint
Axis
Ligamenta flava
Vertebral a.
Suboccipital n.
Anterior atlantooccipital membrane
Capsule of atlantooccipital joint
Posterior atlantooccipital membrane
Atlas
Ligamenta flava
Nuchal ligament
Body of axis
Intervertebral discs
Zygapophysial joints
Anterior tubercle of C6 vertebra (carotid tubercle of Chassaignac)
Vertebral a.
Spinous process of C7 vertebra
T1 vertebra
Supraspinous ligament
Right lateral view
F. Netter M.D.

Internal Craniocervical Ligaments

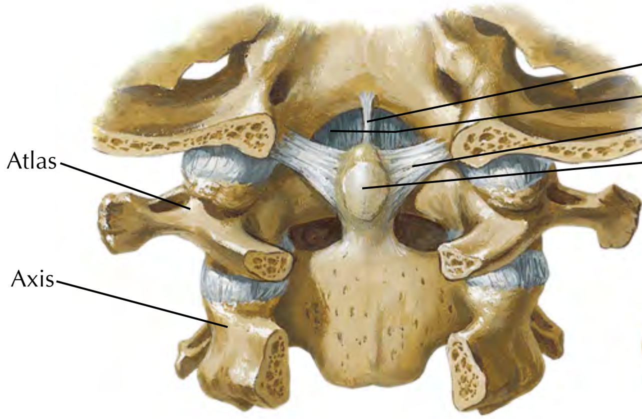
See also **Plates 43, BP 18, BP 35**


Clivus
Capsule of atlantooccipital joint
Atlas
Capsule of lateral atlantoaxial joint
Axis
Capsule of zygapophysial joint (between axis and C3 vertebra)
Tectorial membrane of cervical vertebral column
Accessory atlantoaxial ligament
Posterior longitudinal ligament

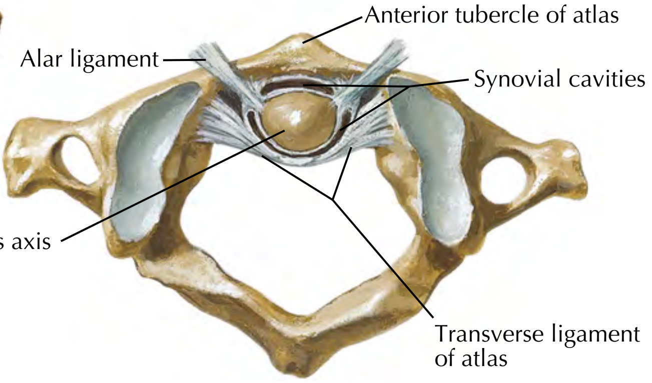
Upper part of vertebral canal: posterior view (spinous processes and parts of vertebral arches removed to expose ligaments posterior to the vertebral bodies)


Alar ligaments
Atlas
Cruciform ligament
Superior longitudinal band
Transverse ligament of atlas
Inferior longitudinal band
Axis
Accessory atlantoaxial ligament

Tectorial membrane removed to expose deeper ligaments: posterior view


Atlas
Axis
Apical ligament of dens
Anterior atlantooccipital ligament
Alar ligament
Posterior articular facet of dens axis

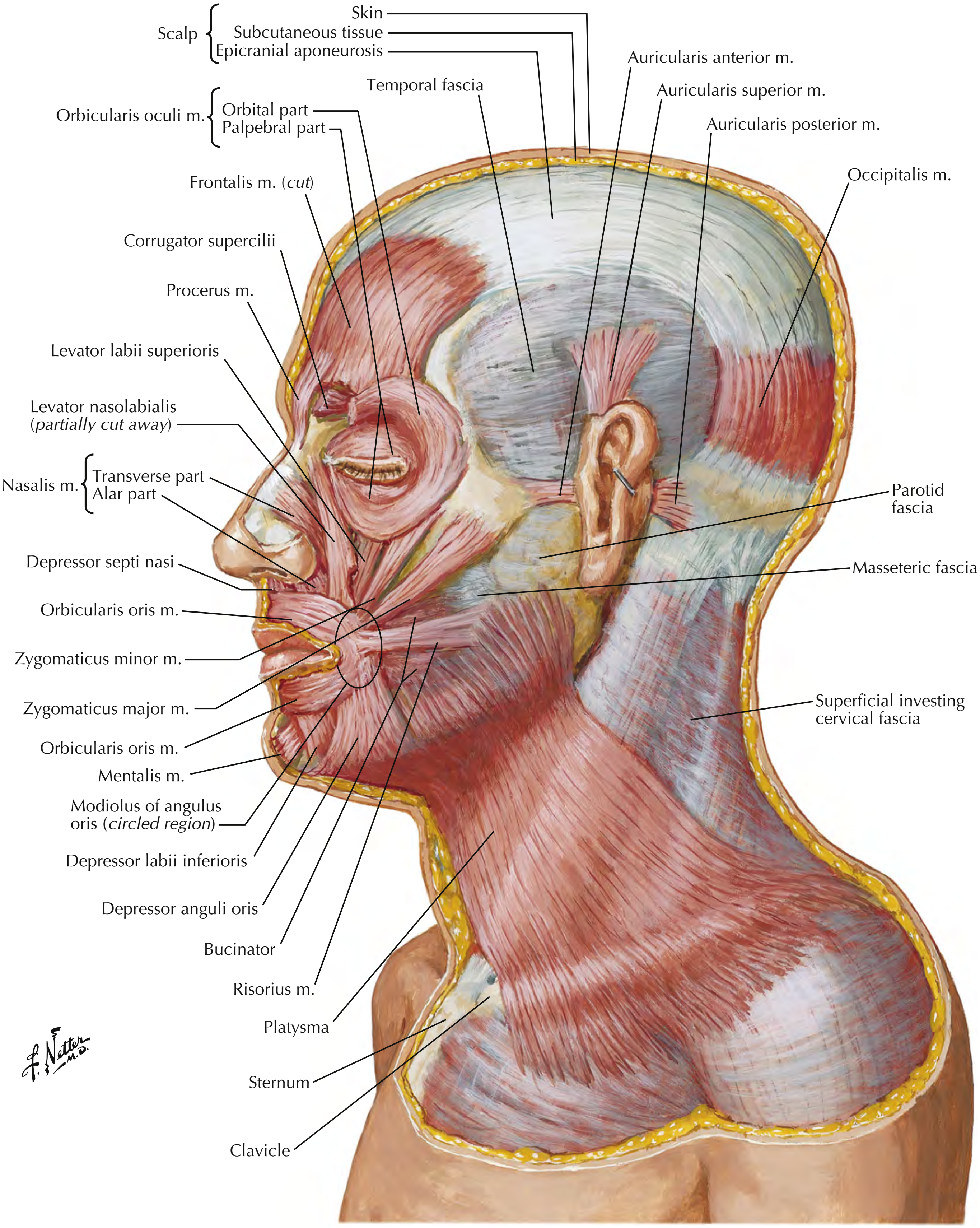
Cruciform ligament removed to show deeper ligaments: posterior view


Anterior tubercle of atlas
Alar ligament
Synovial cavities
Dens axis
Transverse ligament of atlas

Median atlantoaxial joint: superior view

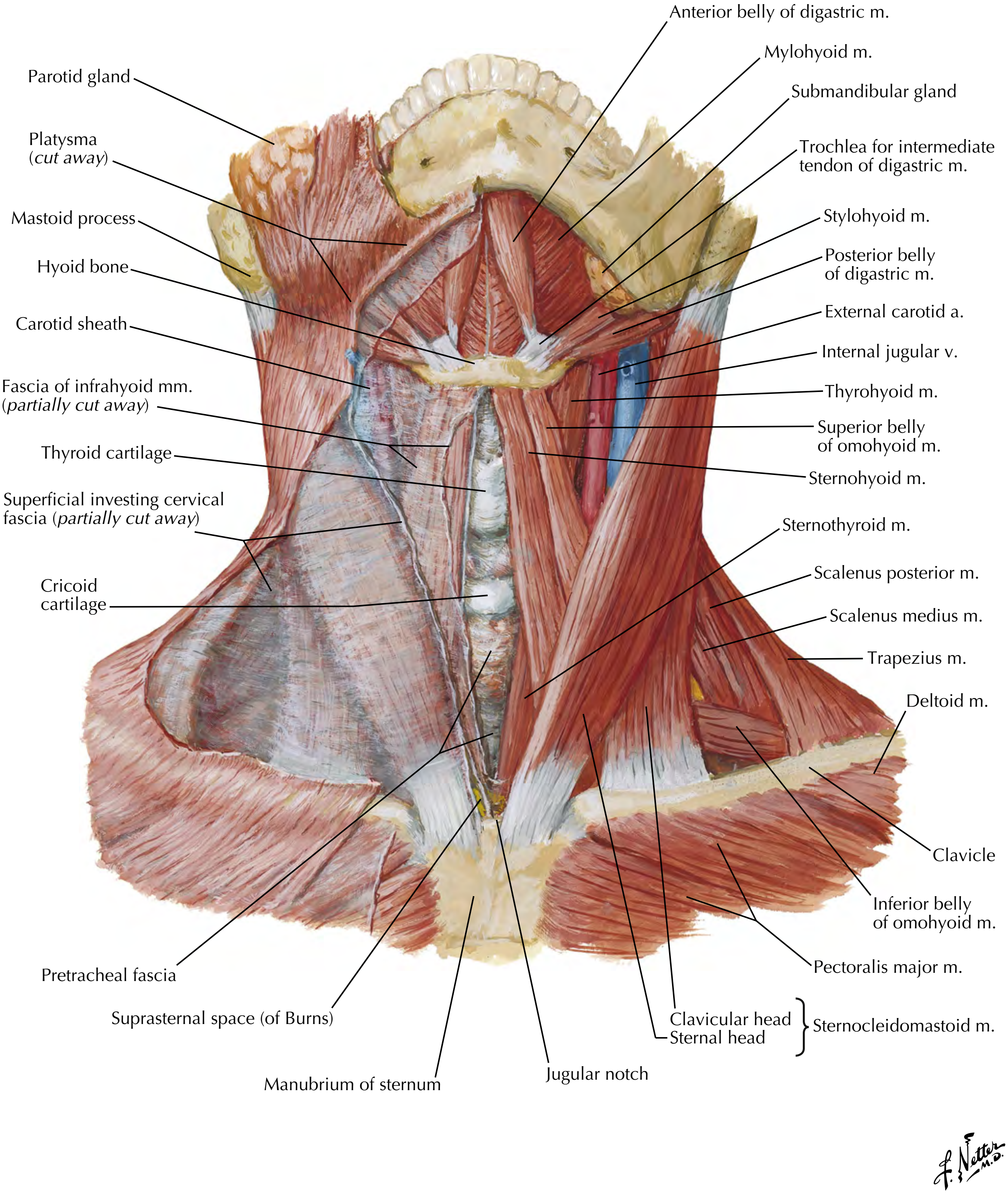
Muscles of Facial Expression: Lateral View

See also **Plates 52, 72, 73, BP 19, BP 20**

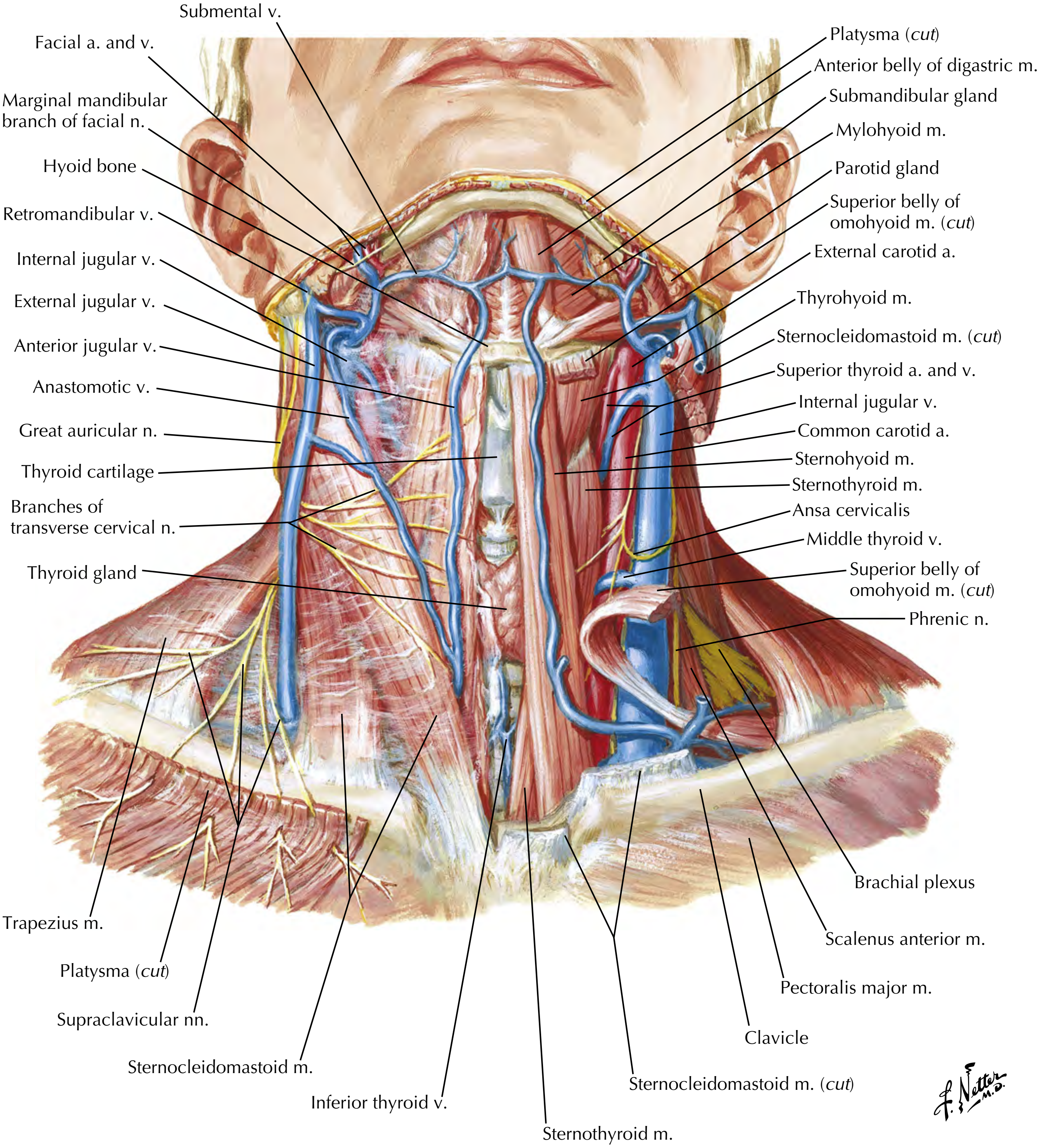

Scalp
Skin
Subcutaneous tissue
Epicranial aponeurosis
Orbicularis oculi m.
Orbital part
Palpebral part
Temporal fascia
Auricularis anterior m.
Auricularis superior m.
Auricularis posterior m.
Occipitalis m.
Frontalis m. (*cut*)
Corrugator supercilii
Procerus m.
Levator labii superioris
Levator nasolabialis (*partially cut away*)
Nasalis m.
Transverse part
Alar part
Parotid fascia
Depressor septi nasi
Masseteric fascia
Orbicularis oris m.
Zygomaticus minor m.
Zygomaticus major m.
Superficial investing cervical fascia
Orbicularis oris m.
Mentalis m.
Modiolus of angulus oris (*circled region*)
Depressor labii inferioris
Depressor anguli oris
Bucinator
Risorius m.
Platysma
Sternum
Clavicle
F. Netter M.D.

Muscles of Neck: Anterior View

See also **Plates 37, 50, 51, 53**


Anterior belly of digastric m.
Mylohyoid m.
Parotid gland
Submandibular gland
Platysma
(*cut away*)
Trochlea for intermediate tendon of digastric m.
Mastoid process
Stylohyoid m.
Hyoid bone
Posterior belly of digastric m.
Carotid sheath
External carotid a.
Internal jugular v.
Fascia of infrahyoid mm. (*partially cut away*)
Thyrohyoid m.
Superior belly of omohyoid m.
Thyroid cartilage
Sternohyoid m.
Superficial investing cervical fascia (*partially cut away*)
Sternothyroid m.
Scalenus posterior m.
Cricoid cartilage
Scalenus medius m.
Trapezius m.
Deltoid m.
Clavicle
Inferior belly of omohyoid m.
Pectoralis major m.
Pretracheal fascia
Suprasternal space (of Burns)
Clavicular head
Sternal head
Sternocleidomastoid m.
Manubrium of sternum
Jugular notch
F. Netter M.D.

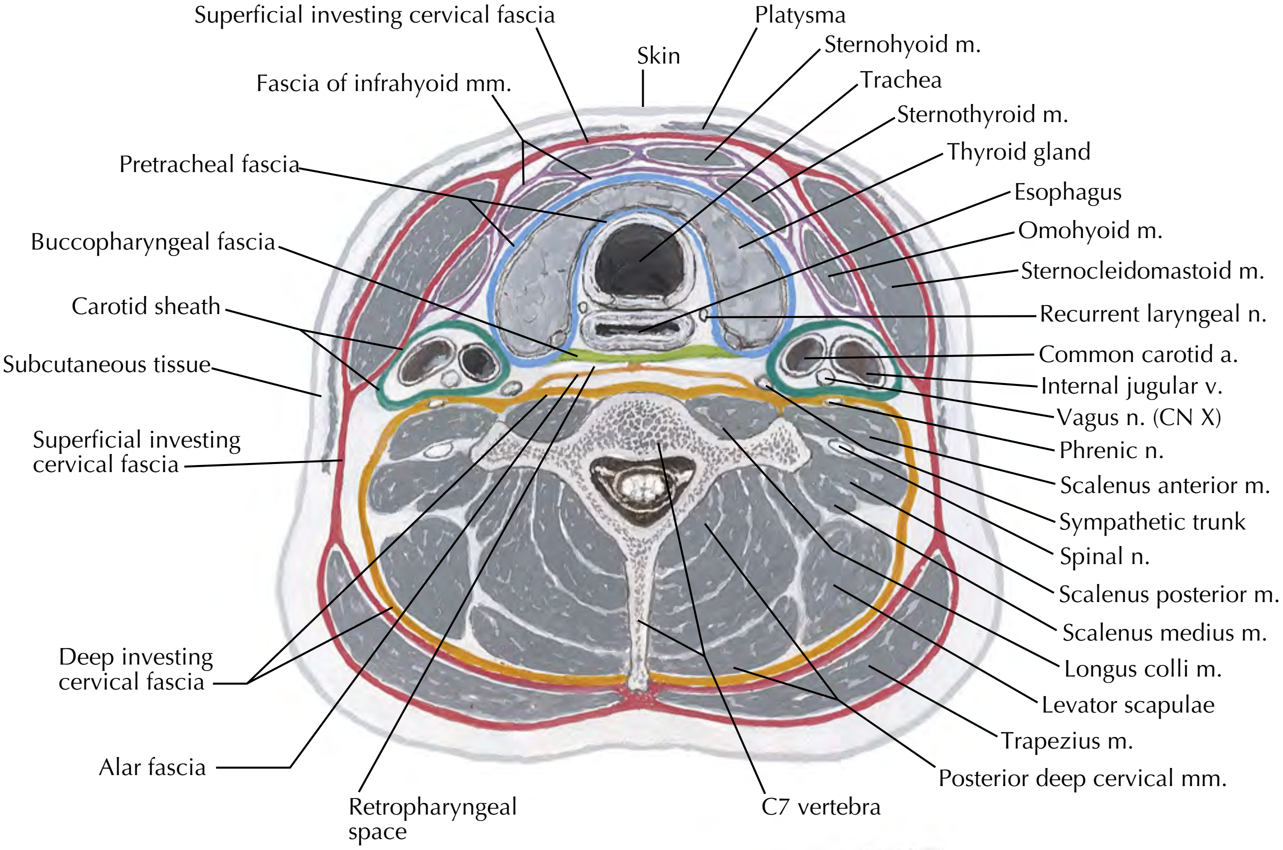
See also **Plates 37, 100**


Submental v.
Facial a. and v.
Marginal mandibular branch of facial n.
Hyoid bone
Retromandibular v.
Internal jugular v.
External jugular v.
Anterior jugular v.
Anastomotic v.
Great auricular n.
Thyroid cartilage
Branches of transverse cervical n.
Thyroid gland
Trapezius m.
Platysma (*cut*)
Supraclavicular nn.
Sternocleidomastoid m.
Inferior thyroid v.
Sternothyroid m.
Sternocleidomastoid m. (*cut*)
Clavicle
Pectoralis major m.
Scalenus anterior m.
Brachial plexus
Platysma (*cut*)
Anterior belly of digastric m.
Submandibular gland
Mylohyoid m.
Parotid gland
Superior belly of omohyoid m. (*cut*)
External carotid a.
Thyrohyoid m.
Sternocleidomastoid m. (*cut*)
Superior thyroid a. and v.
Internal jugular v.
Common carotid a.
Sternohyoid m.
Sternothyroid m.
Ansa cervicalis
Middle thyroid v.
Superior belly of omohyoid m. (*cut*)
Phrenic n.
F. Netter M.D.

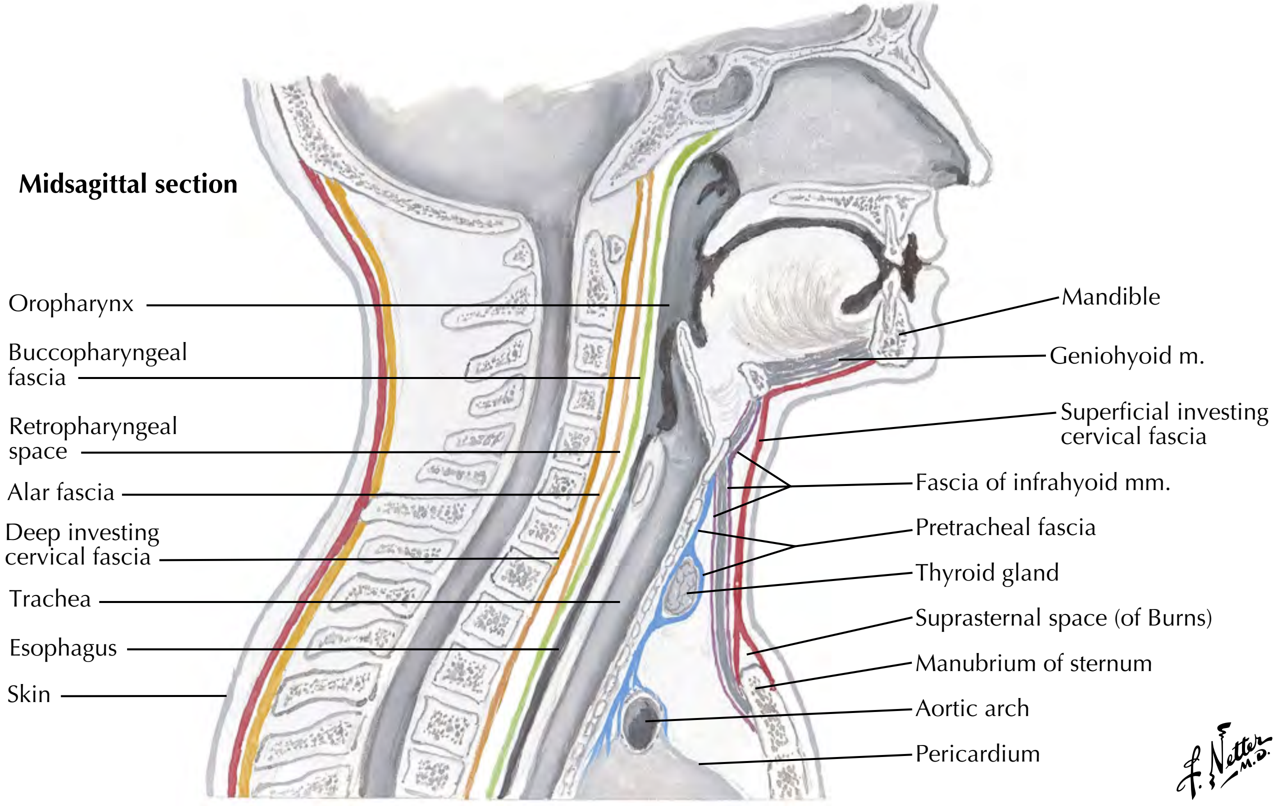
Fascial Layers of Neck

See also **Plate 49**

Cross section

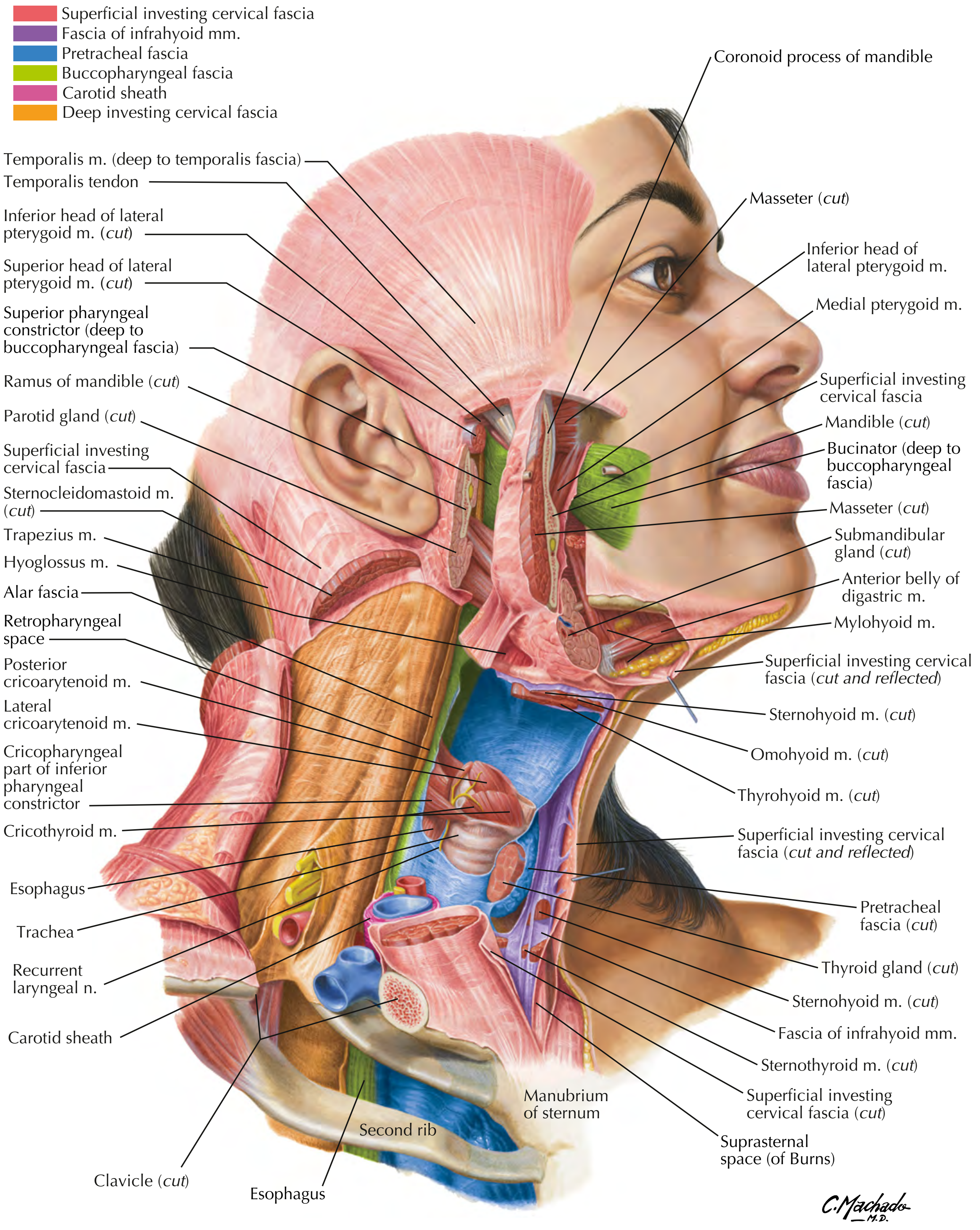

Superficial investing cervical fascia
Platysma
Skin
Sternohyoid m.
Fascia of infrahyoid mm.
Trachea
Sternothyroid m.
Pretracheal fascia
Thyroid gland
Esophagus
Buccopharyngeal fascia
Omohyoid m.
Sternocleidomastoid m.
Carotid sheath
Recurrent laryngeal n.
Subcutaneous tissue
Common carotid a.
Internal jugular v.
Vagus n. (CN X)
Superficial investing cervical fascia
Phrenic n.
Scalenus anterior m.
Sympathetic trunk
Spinal n.
Scalenus posterior m.
Scalenus medius m.
Deep investing cervical fascia
Longus colli m.
Levator scapulae
Trapezius m.
Alar fascia
Posterior deep cervical mm.
Retropharyngeal space
C7 vertebra

Midsagittal section

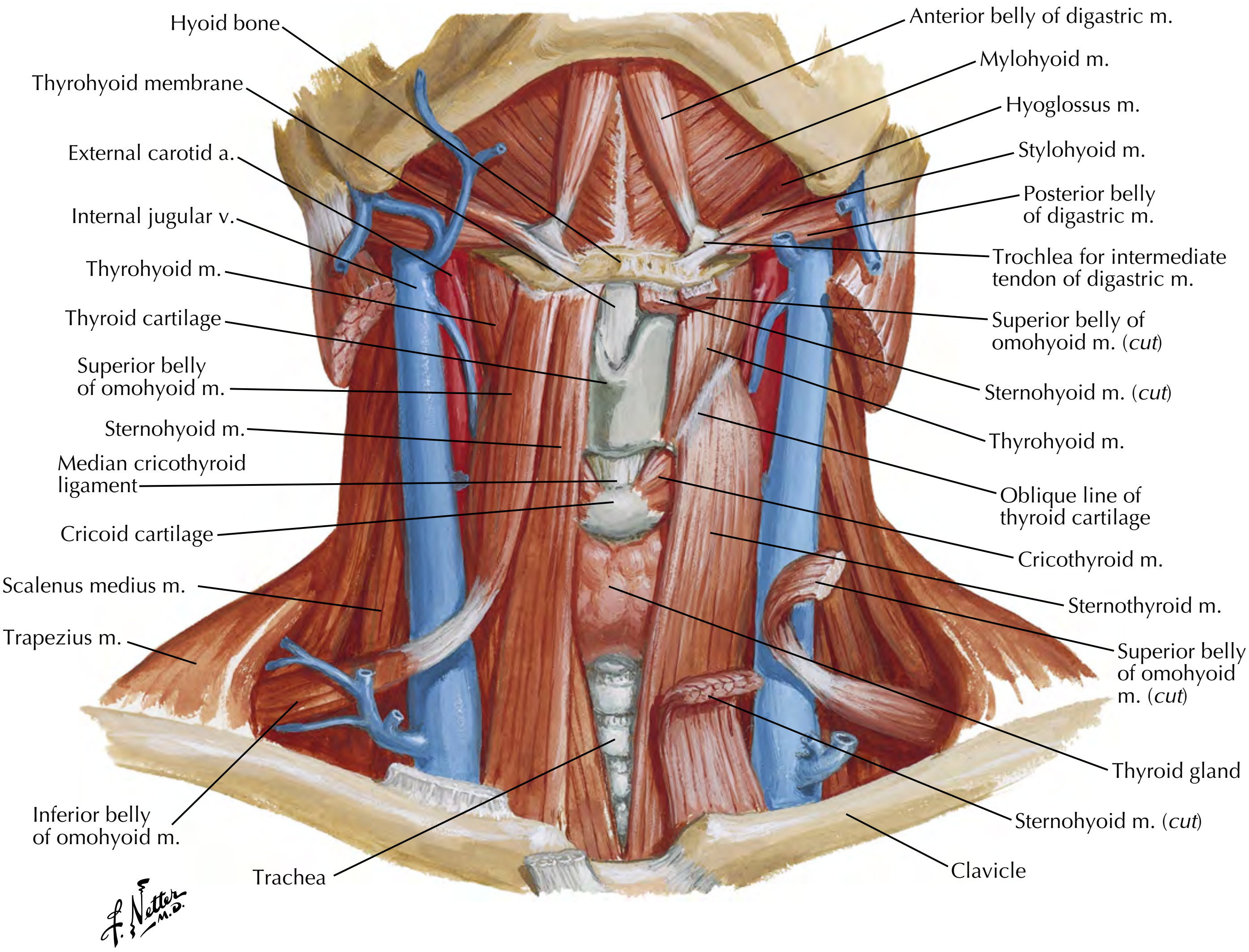

Oropharynx
Mandible
Buccopharyngeal fascia
Geniohyoid m.
Superficial investing cervical fascia
Retropharyngeal space
Fascia of infrahyoid mm.
Alar fascia
Pretracheal fascia
Deep investing cervical fascia
Thyroid gland
Trachea
Suprasternal space (of Burns)
Esophagus
Manubrium of sternum
Skin
Aortic arch
Pericardium

Cervical Fasciae

See also **Plates 49, 50, 51**

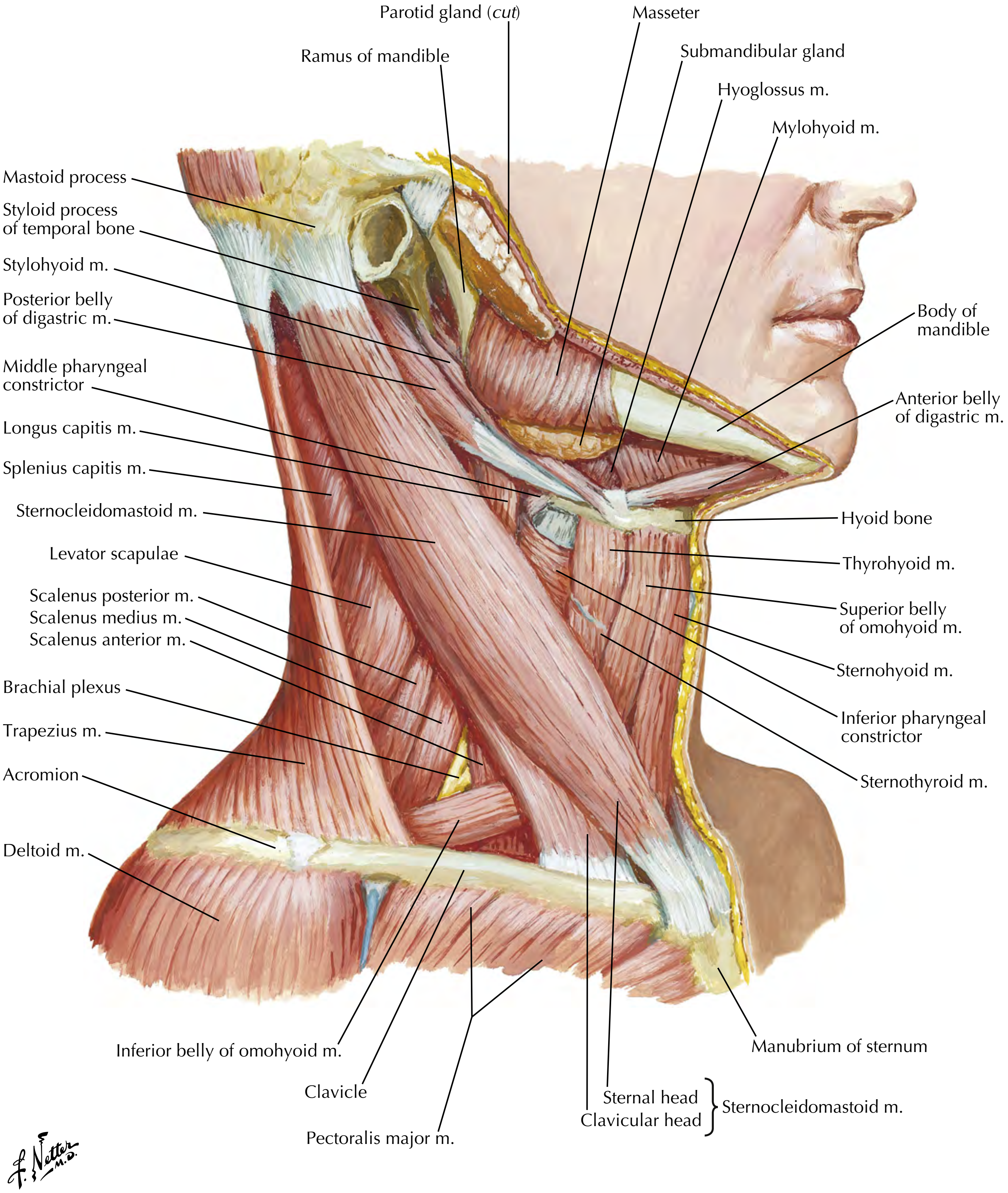

Superficial investing cervical fascia
Fascia of infrahyoid mm.
Pretracheal fascia
Buccopharyngeal fascia
Carotid sheath
Deep investing cervical fascia
Temporalis m. (deep to temporalis fascia)
Temporalis tendon
Inferior head of lateral pterygoid m. (*cut*)
Superior head of lateral pterygoid m. (*cut*)
Superior pharyngeal constrictor (deep to buccopharyngeal fascia)
Ramus of mandible (*cut*)
Parotid gland (*cut*)
Superficial investing cervical fascia
Sternocleidomastoid m. (*cut*)
Trapezius m.
Hyoglossus m.
Alar fascia
Retropharyngeal space
Posterior cricoarytenoid m.
Lateral cricoarytenoid m.
Cricopharyngeal part of inferior pharyngeal constrictor
Cricothyroid m.
Esophagus
Trachea
Recurrent laryngeal n.
Carotid sheath
Clavicle (*cut*)
Esophagus
Second rib
Manubrium of sternum
Coronoid process of mandible
Masseter (*cut*)
Inferior head of lateral pterygoid m.
Medial pterygoid m.
Superficial investing cervical fascia
Mandible (*cut*)
Bucinator (deep to buccopharyngeal fascia)
Masseter (*cut*)
Submandibular gland (*cut*)
Anterior belly of digastric m.
Mylohyoid m.
Superficial investing cervical fascia (*cut and reflected*)
Sternohyoid m. (*cut*)
Omohyoid m. (*cut*)
Thyrohyoid m. (*cut*)
Superficial investing cervical fascia (*cut and reflected*)
Pretracheal fascia (*cut*)
Thyroid gland (*cut*)
Sternohyoid m. (*cut*)
Fascia of infrahyoid mm.
Sternothyroid m. (*cut*)
Superficial investing cervical fascia (*cut*)
Suprasternal space (of Burns)
C. Machado M.D.

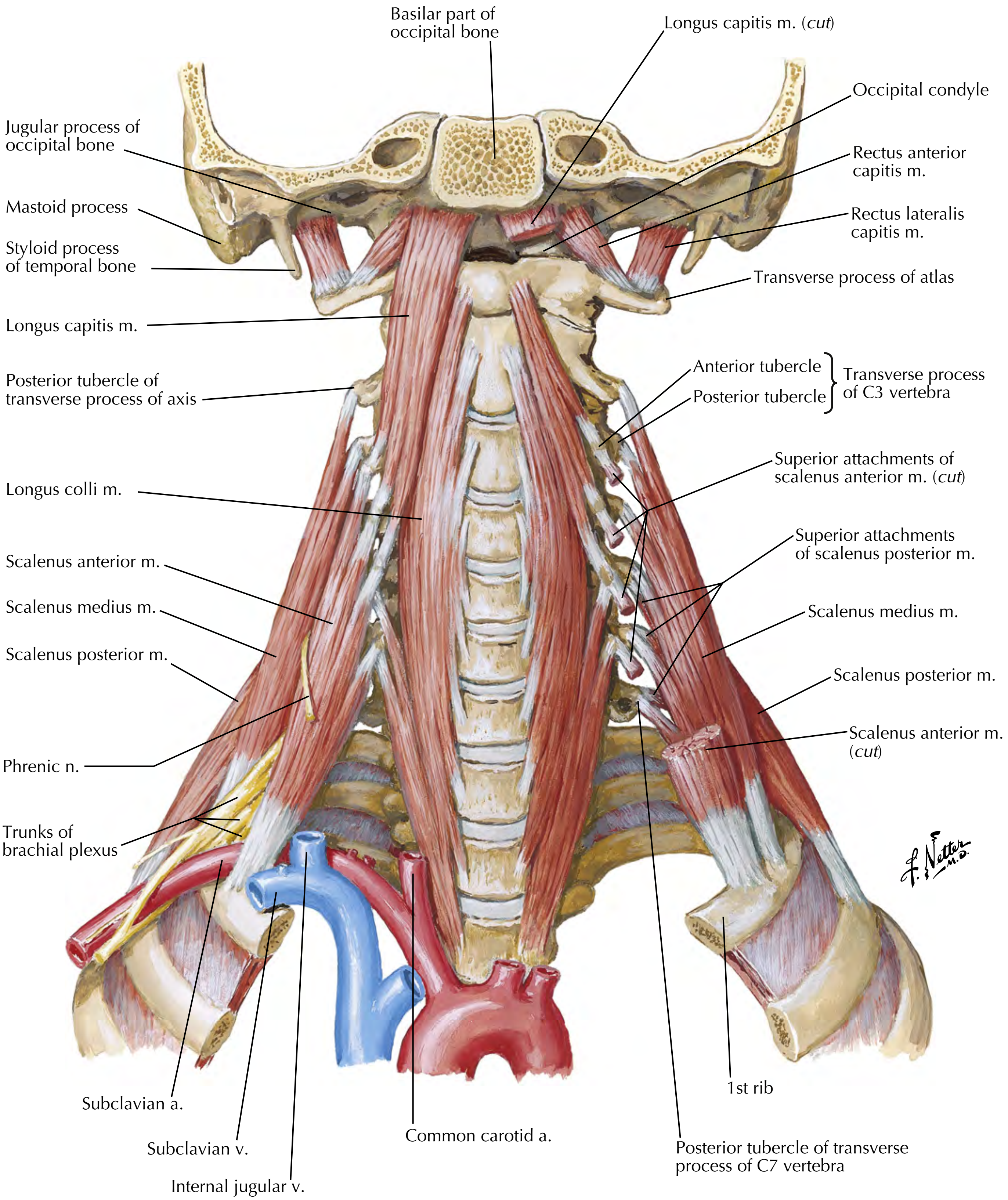
See also **Plates 49, 54, 87**


Hyoid bone
Thyrohyoid membrane
External carotid a.
Internal jugular v.
Thyrohyoid m.
Thyroid cartilage
Superior belly of omohyoid m.
Sternohyoid m.
Median cricothyroid ligament
Cricoid cartilage
Scalenus medius m.
Trapezius m.
Inferior belly of omohyoid m.
Trachea
Anterior belly of digastric m.
Mylohyoid m.
Hyoglossus m.
Stylohyoid m.
Posterior belly of digastric m.
Trochlea for intermediate tendon of digastric m.
Superior belly of omohyoid m. (*cut*)
Sternohyoid m. (*cut*)
Thyrohyoid m.
Oblique line of thyroid cartilage
Cricothyroid m.
Sternothyroid m.
Superior belly of omohyoid m. (*cut*)
Thyroid gland
Sternohyoid m. (*cut*)
Clavicle
F. Netter M.D.

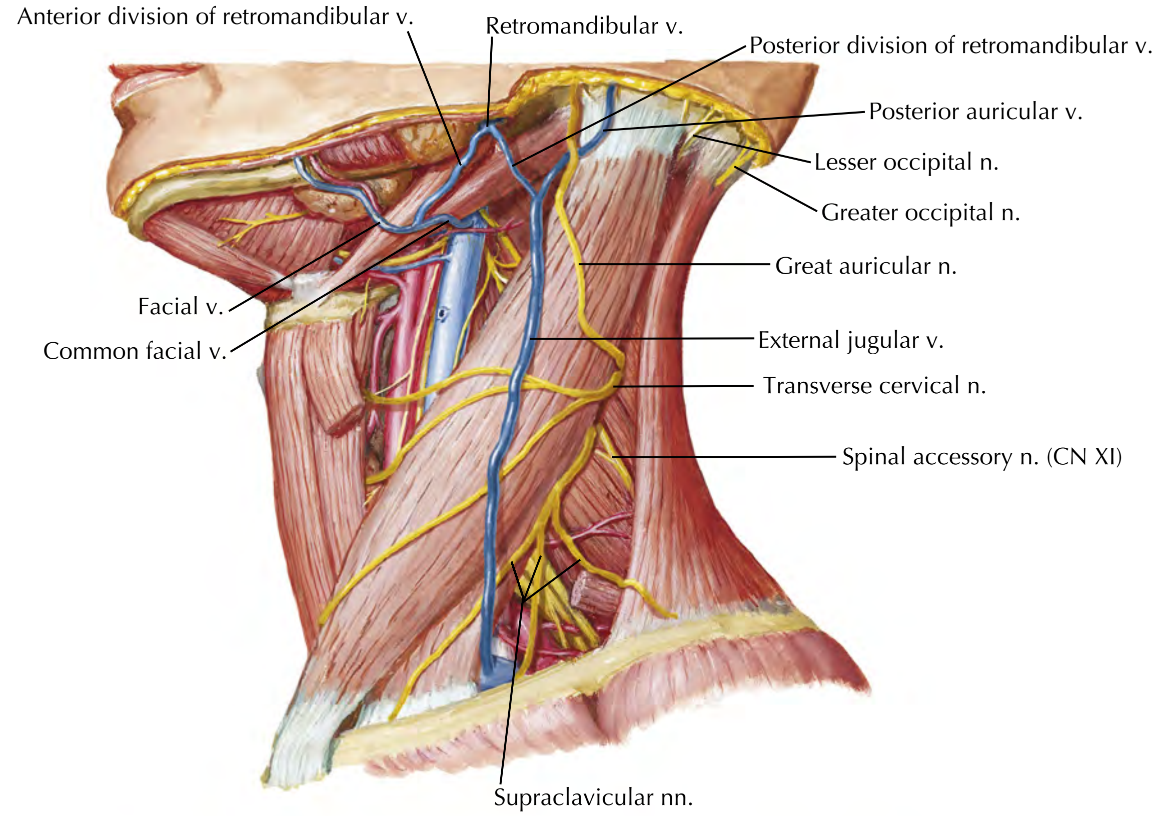
Muscles of Neck: Lateral View

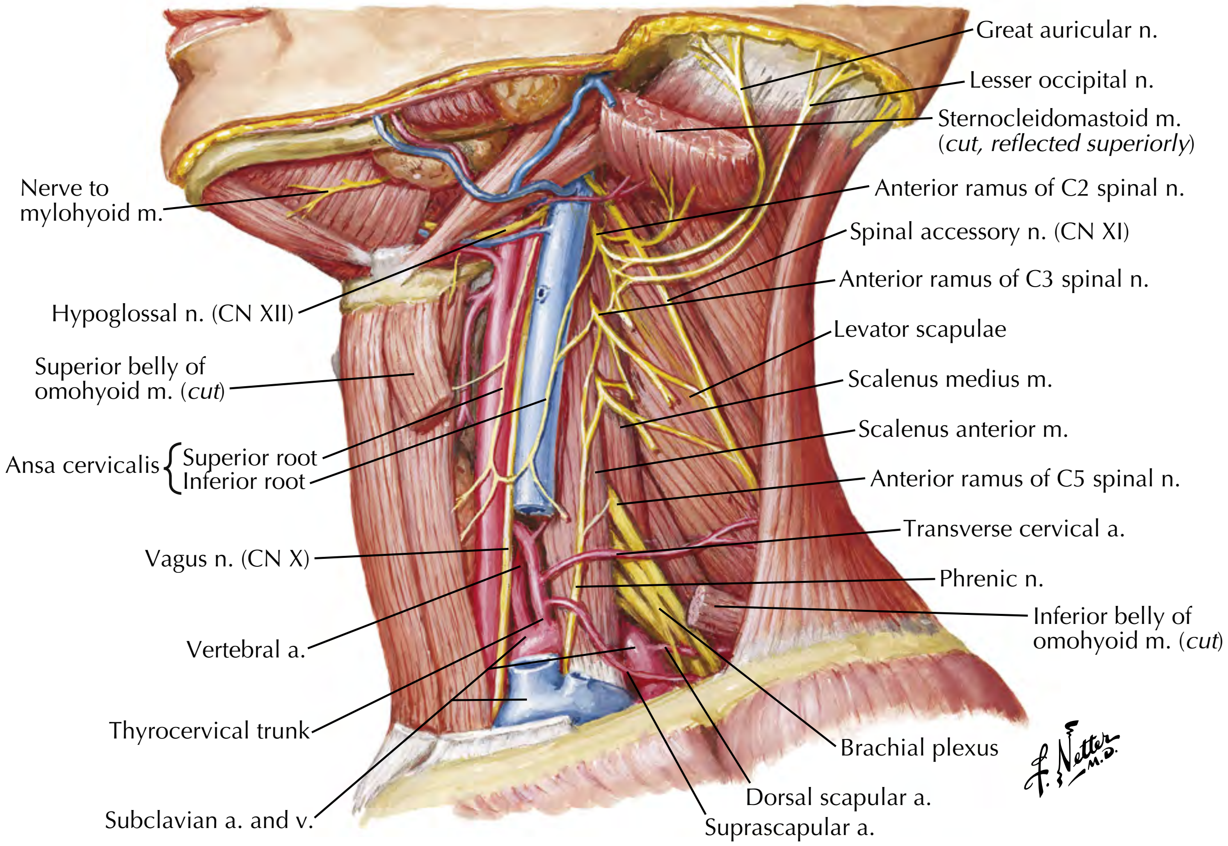
See also **Plates 49, 50, 53**


Parotid gland (*cut*)
Masseter
Ramus of mandible
Submandibular gland
Hyoglossus m.
Mylohyoid m.
Mastoid process
Styloid process of temporal bone
Stylohyoid m.
Posterior belly of digastric m.
Body of mandible
Middle pharyngeal constrictor
Anterior belly of digastric m.
Longus capitis m.
Splenius capitis m.
Sternocleidomastoid m.
Hyoid bone
Thyrohyoid m.
Levator scapulae
Superior belly of omohyoid m.
Scalenus posterior m.
Scalenus medius m.
Scalenus anterior m.
Sternohyoid m.
Brachial plexus
Inferior pharyngeal constrictor
Trapezius m.
Sternothyroid m.
Acromion
Deltoid m.
Inferior belly of omohyoid m.
Manubrium of sternum
Clavicle
Sternal head
Clavicular head
Sternocleidomastoid m.
Pectoralis major m.
F. Netter M.D.


Basilar part of occipital bone
Longus capitis m. (*cut*)
Occipital condyle
Jugular process of occipital bone
Rectus anterior capitis m.
Mastoid process
Rectus lateralis capitis m.
Styloid process of temporal bone
Transverse process of atlas
Longus capitis m.
Anterior tubercle
Posterior tubercle
Transverse process of C3 vertebra
Posterior tubercle of transverse process of axis
Superior attachments of scalenus anterior m. (*cut*)
Longus colli m.
Superior attachments of scalenus posterior m.
Scalenus anterior m.
Scalenus medius m.
Scalenus medius m.
Scalenus posterior m.
Scalenus posterior m.
Scalenus anterior m. (*cut*)
Phrenic n.
Trunks of brachial plexus
F. Netter M.D.
1st rib
Subclavian a.
Common carotid a.
Posterior tubercle of transverse process of C7 vertebra
Subclavian v.
Internal jugular v.

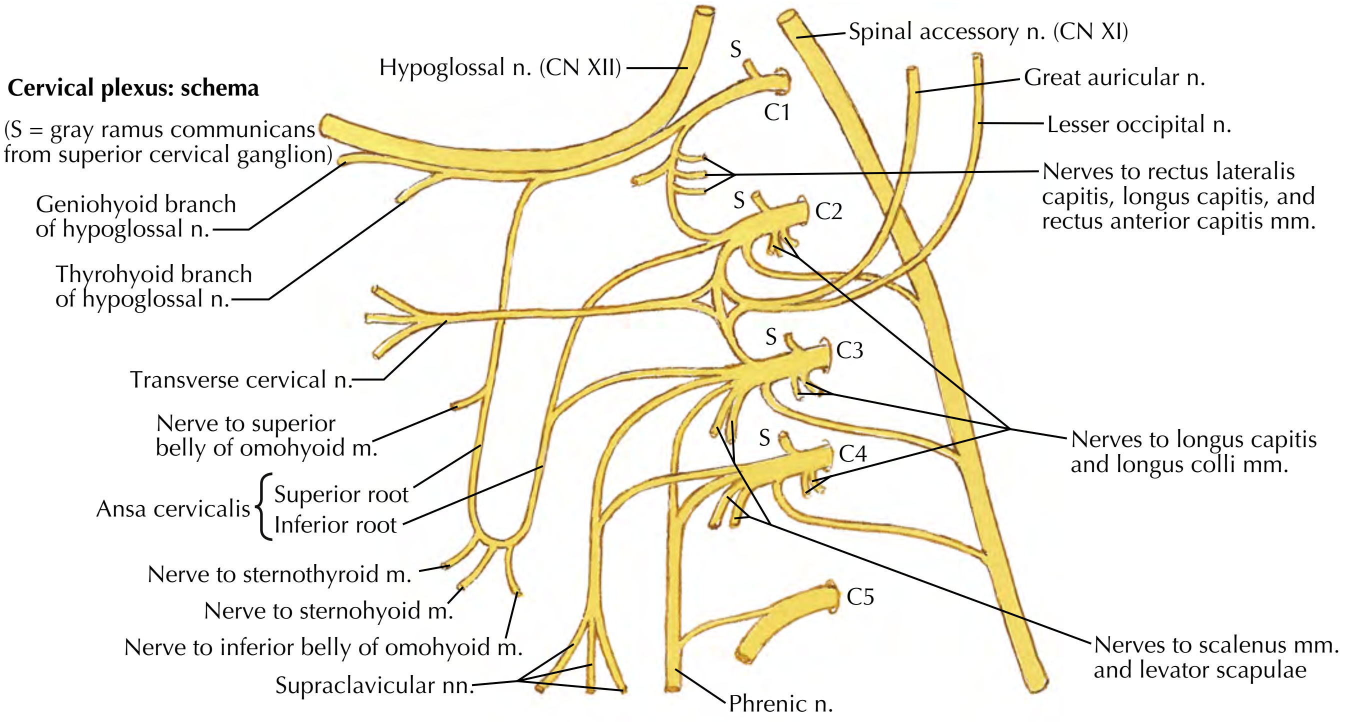
See also **Plates 154, 155, 156**


Anterior division of retromandibular v.
Retromandibular v.
Posterior division of retromandibular v.
Posterior auricular v.
Lesser occipital n.
Greater occipital n.
Great auricular n.
Facial v.
Common facial v.
External jugular v.
Transverse cervical n.
Spinal accessory n. (CN XI)
Supraclavicular nn.


Great auricular n.
Lesser occipital n.
Sternocleidomastoid m. (cut, reflected superiorly)
Nerve to mylohyoid m.
Anterior ramus of C2 spinal n.
Spinal accessory n. (CN XI)
Anterior ramus of C3 spinal n.
Hypoglossal n. (CN XII)
Levator scapulae
Superior belly of omohyoid m. (cut)
Scalenus medius m.
Scalenus anterior m.
Ansa cervicalis
Superior root
Inferior root
Anterior ramus of C5 spinal n.
Transverse cervical a.
Vagus n. (CN X)
Phrenic n.
Inferior belly of omohyoid m. (cut)
Vertebral a.
Thyrocervical trunk
Brachial plexus
Dorsal scapular a.
Subclavian a. and v.
Suprascapular a.

Nerves of Neck and Cervical Plexus

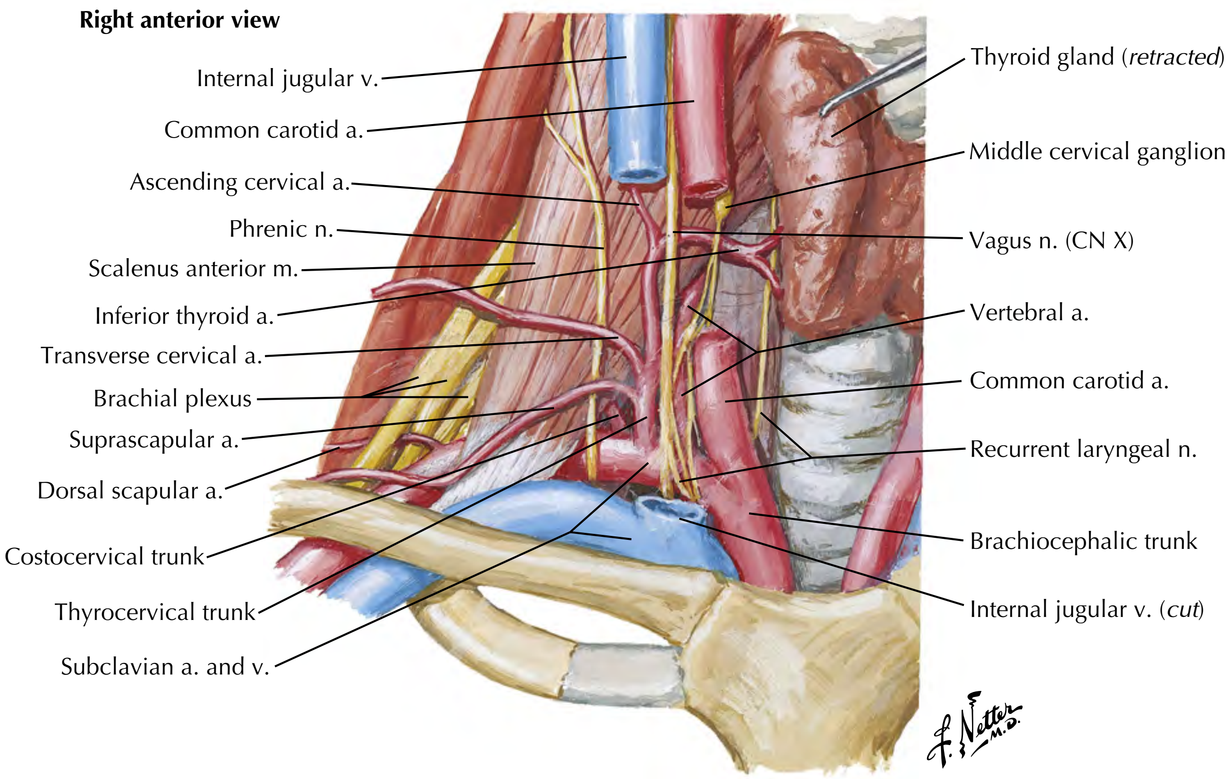
See also **Plate 156**



Cervical plexus: schema

(S = gray ramus communicans from superior cervical ganglion)

Hypoglossal n. (CN XII)
S
C1
Spinal accessory n. (CN XI)
Great auricular n.
Lesser occipital n.
Nerves to rectus lateralis capitis, longus capitis, and rectus anterior capitis mm.
Geniohyoid branch of hypoglossal n.
Thyrohyoid branch of hypoglossal n.
S
C2
Transverse cervical n.
S
C3
Nerve to superior belly of omohyoid m.
Nerves to longus capitis and longus colli mm.
S
C4
Ansa cervicalis
Superior root
Inferior root
Nerve to sternothyroid m.
Nerve to sternohyoid m.
C5
Nerve to inferior belly of omohyoid m.
Nerves to scalenus mm. and levator scapulae
Supraclavicular nn.
Phrenic n.

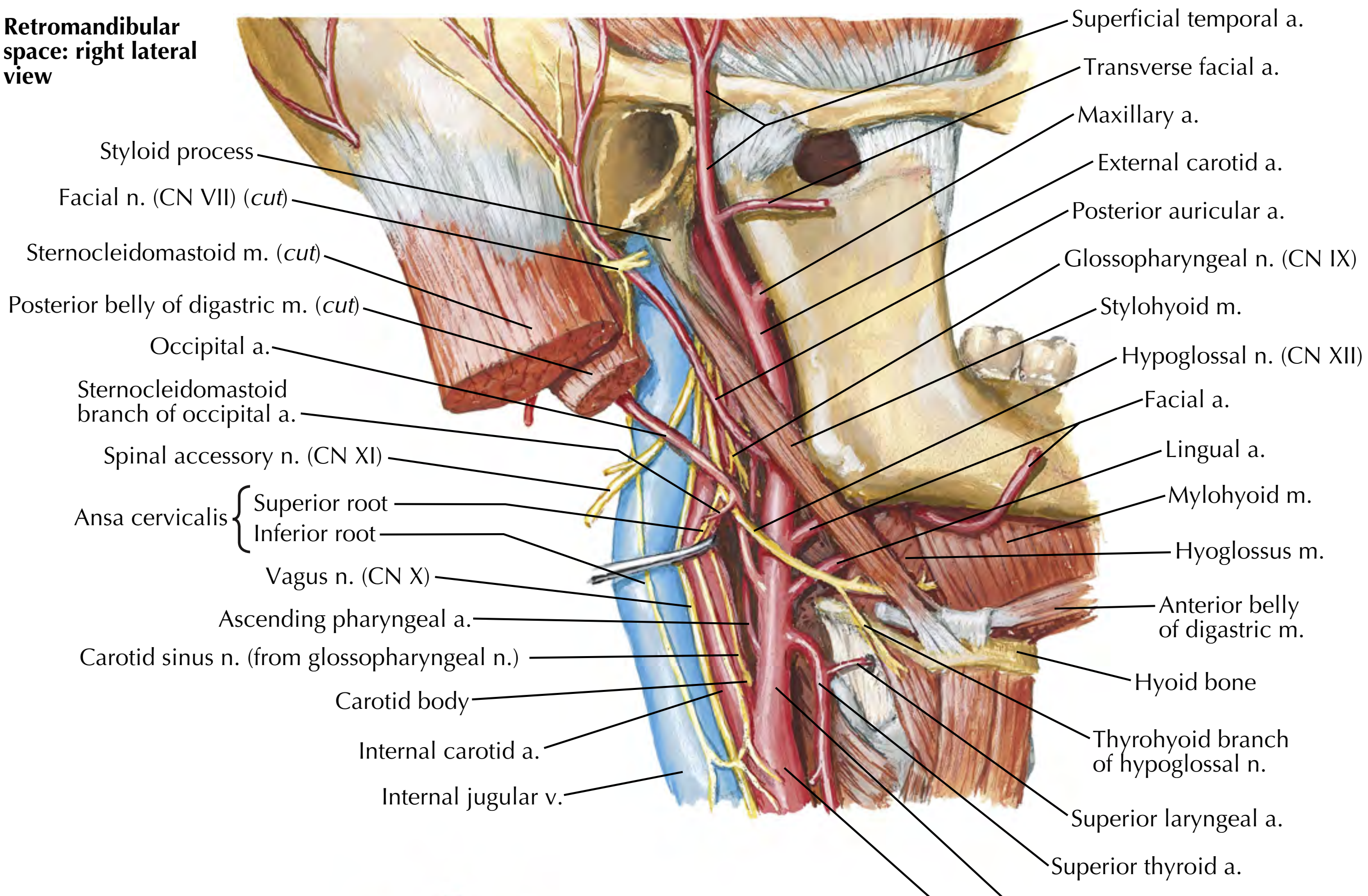


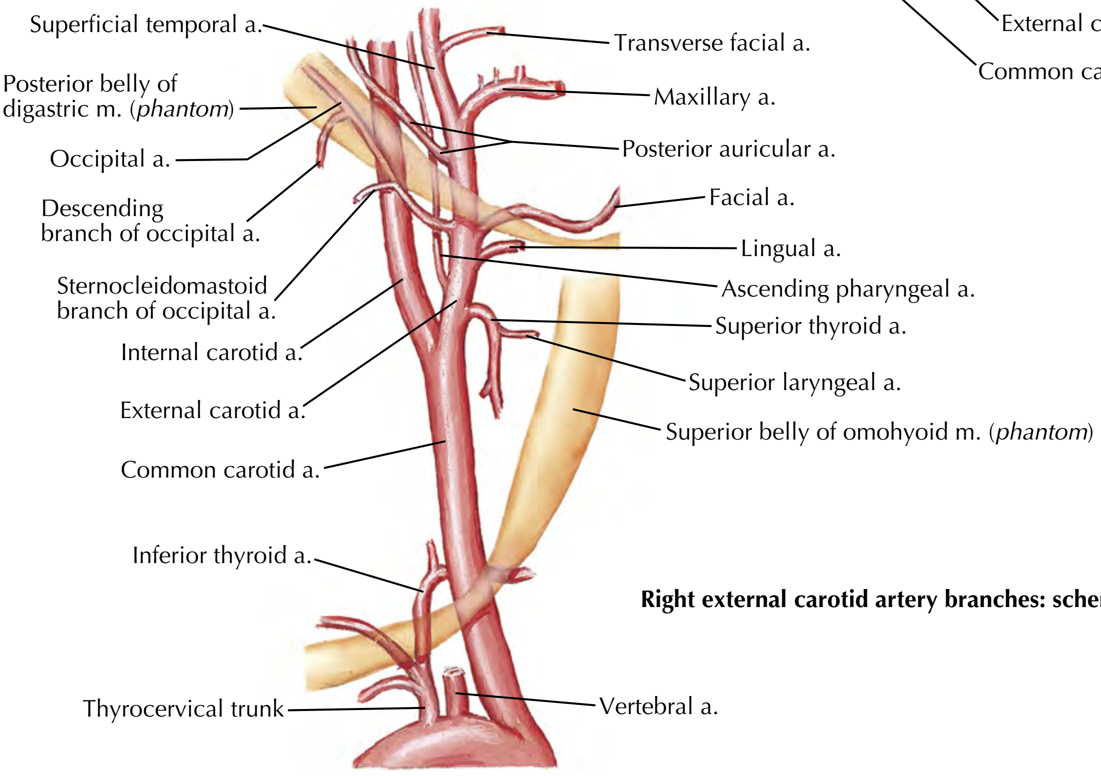
Right anterior view

Internal jugular v.
Common carotid a.
Ascending cervical a.
Phrenic n.
Scalenus anterior m.
Inferior thyroid a.
Transverse cervical a.
Brachial plexus
Suprascapular a.
Dorsal scapular a.
Costocervical trunk
Thyrocervical trunk
Subclavian a. and v.
Thyroid gland (*retracted*)
Middle cervical ganglion
Vagus n. (CN X)
Vertebral a.
Common carotid a.
Recurrent laryngeal n.
Brachiocephalic trunk
Internal jugular v. (*cut*)

See also **Plates 163, 165**

Retromandibular space: right lateral view


Superficial temporal a.
Transverse facial a.
Maxillary a.
External carotid a.
Posterior auricular a.
Glossopharyngeal n. (CN IX)
Stylohyoid m.
Hypoglossal n. (CN XII)
Facial a.
Lingual a.
Mylohyoid m.
Hyoglossus m.
Anterior belly of digastric m.
Hyoid bone
Thyrohyoid branch of hypoglossal n.
Superior laryngeal a.
Superior thyroid a.
External carotid a.
Common carotid a.
Styloid process
Facial n. (CN VII) (*cut*)
Sternocleidomastoid m. (*cut*)
Posterior belly of digastric m. (*cut*)
Occipital a.
Sternocleidomastoid branch of occipital a.
Spinal accessory n. (CN XI)
Ansa cervicalis
Superior root
Inferior root
Vagus n. (CN X)
Ascending pharyngeal a.
Carotid sinus n. (from glossopharyngeal n.)
Carotid body
Internal carotid a.
Internal jugular v.

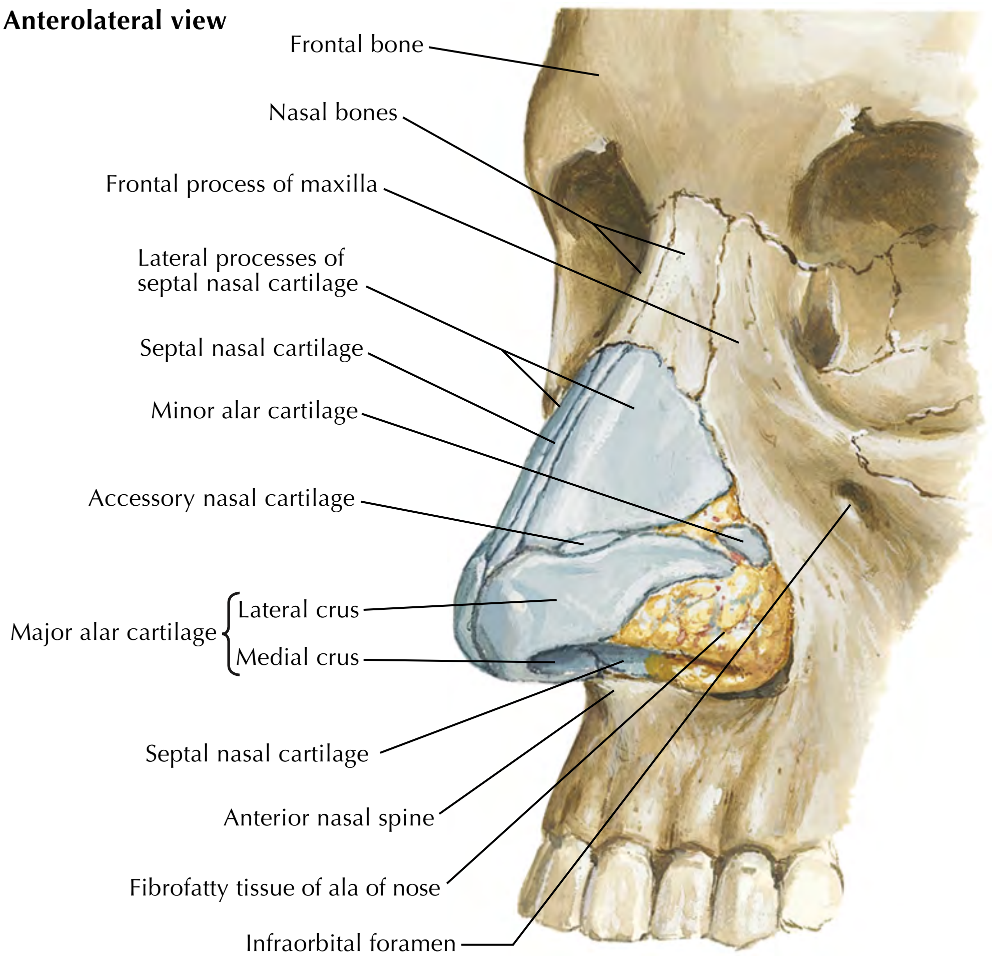

Superficial temporal a.
Posterior belly of digastric m. (*phantom*)
Occipital a.
Descending branch of occipital a.
Sternocleidomastoid branch of occipital a.
Internal carotid a.
External carotid a.
Common carotid a.
Inferior thyroid a.
Thyrocervical trunk
Transverse facial a.
Maxillary a.
Posterior auricular a.
Facial a.
Lingual a.
Ascending pharyngeal a.
Superior thyroid a.
Superior laryngeal a.
Superior belly of omohyoid m. (*phantom*)
Vertebral a.

Right external carotid artery branches: schema

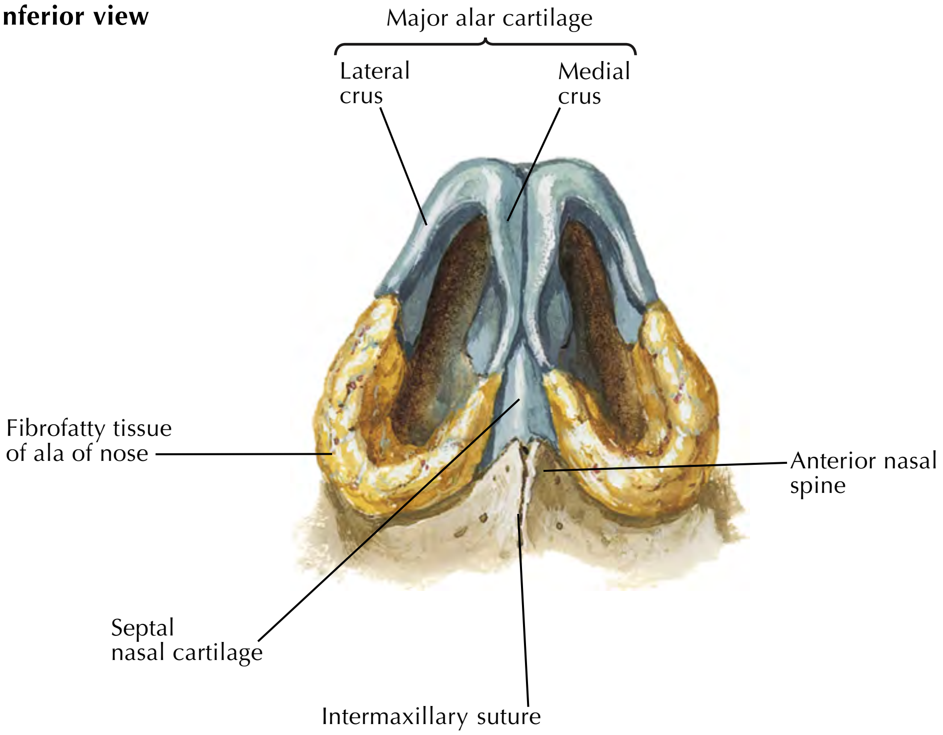
Skeleton of Nose

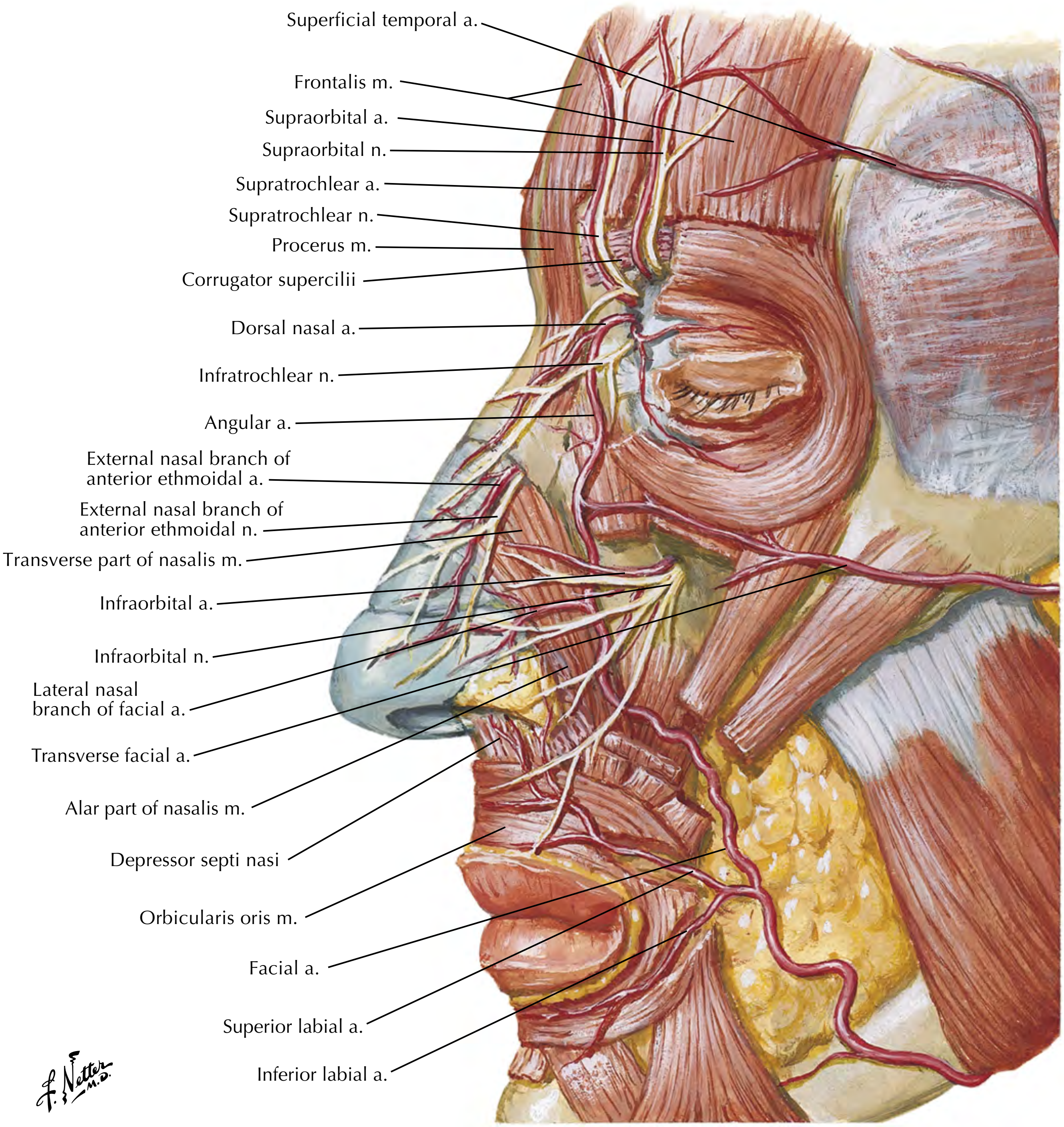
See also **Plate 63**

Anterolateral view

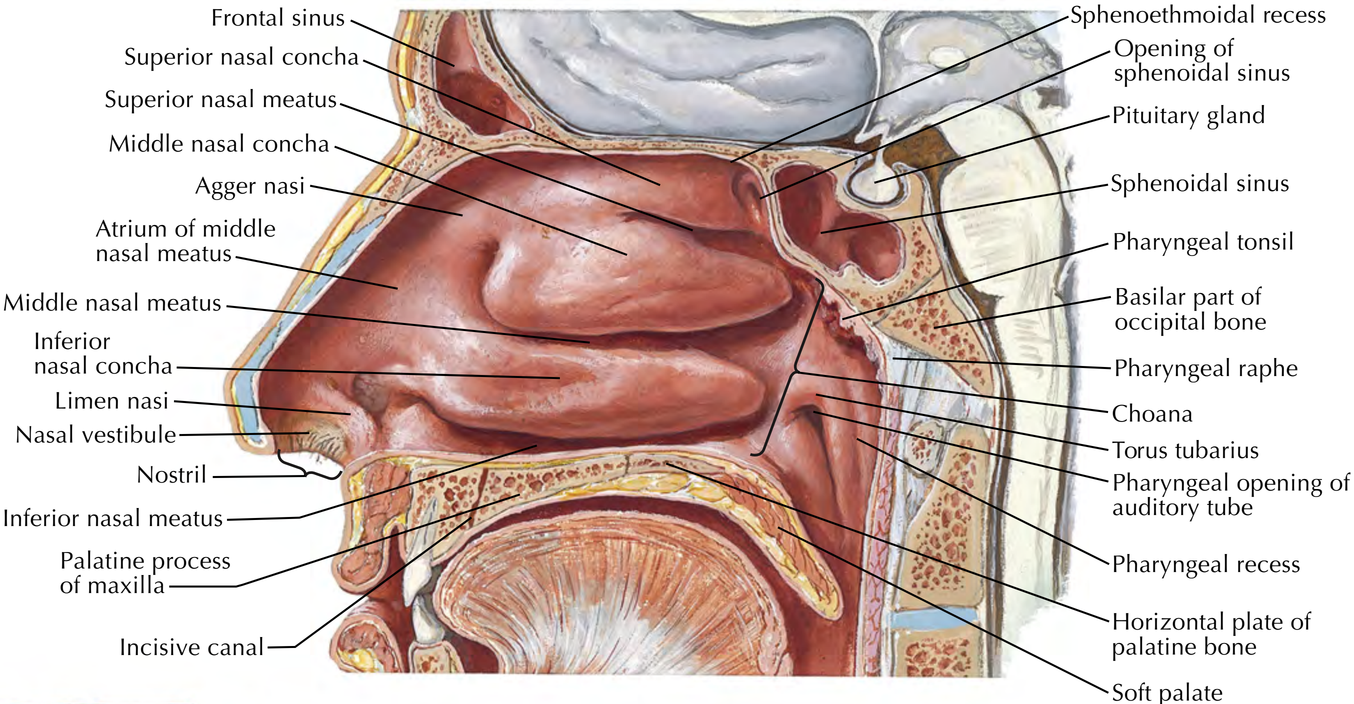

Frontal bone
Nasal bones
Frontal process of maxilla
Lateral processes of septal nasal cartilage
Septal nasal cartilage
Minor alar cartilage
Accessory nasal cartilage
Major alar cartilage
Lateral crus
Medial crus
Septal nasal cartilage
Anterior nasal spine
Fibrofatty tissue of ala of nose
Infraorbital foramen

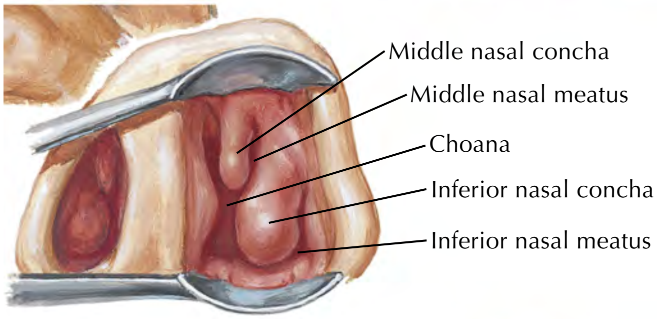
Inferior view


Major alar cartilage
Lateral crus
Medial crus
Fibrofatty tissue of ala of nose
Anterior nasal spine
Septal nasal cartilage
Intermaxillary suture

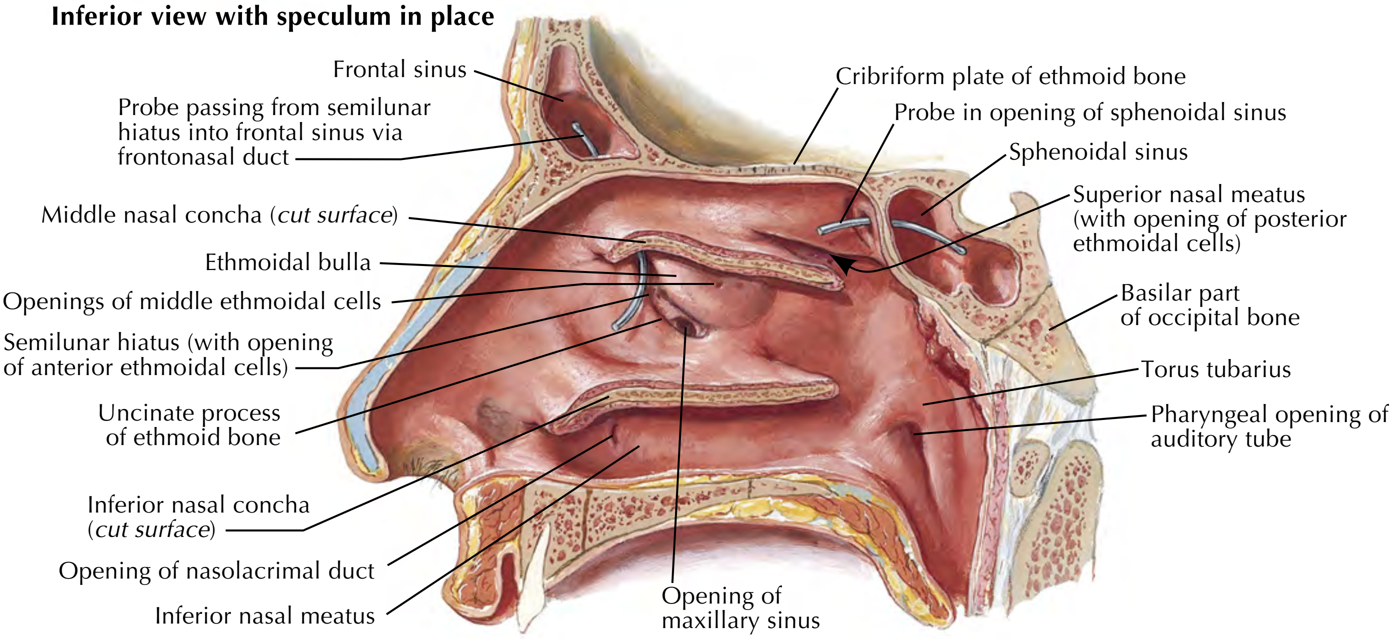

Superficial temporal a.
Frontalis m.
Supraorbital a.
Supraorbital n.
Supratrochlear a.
Supratrochlear n.
Procerus m.
Corrugator supercilii
Dorsal nasal a.
Infratrochlear n.
Angular a.
External nasal branch of anterior ethmoidal a.
External nasal branch of anterior ethmoidal n.
Transverse part of nasalis m.
Infraorbital a.
Infraorbital n.
Lateral nasal branch of facial a.
Transverse facial a.
Alar part of nasalis m.
Depressor septi nasi
Orbicularis oris m.
Facial a.
Superior labial a.
Inferior labial a.

Lateral Wall of Nasal Cavity


Frontal sinus
Superior nasal concha
Superior nasal meatus
Middle nasal concha
Agger nasi
Atrium of middle nasal meatus
Middle nasal meatus
Inferior nasal concha
Limen nasi
Nasal vestibule
Nostril
Inferior nasal meatus
Palatine process of maxilla
Incisive canal
Sphenoethmoidal recess
Opening of sphenoidal sinus
Pituitary gland
Sphenoidal sinus
Pharyngeal tonsil
Basilar part of occipital bone
Pharyngeal raphe
Choana
Torus tubarius
Pharyngeal opening of auditory tube
Pharyngeal recess
Horizontal plate of palatine bone
Soft palate

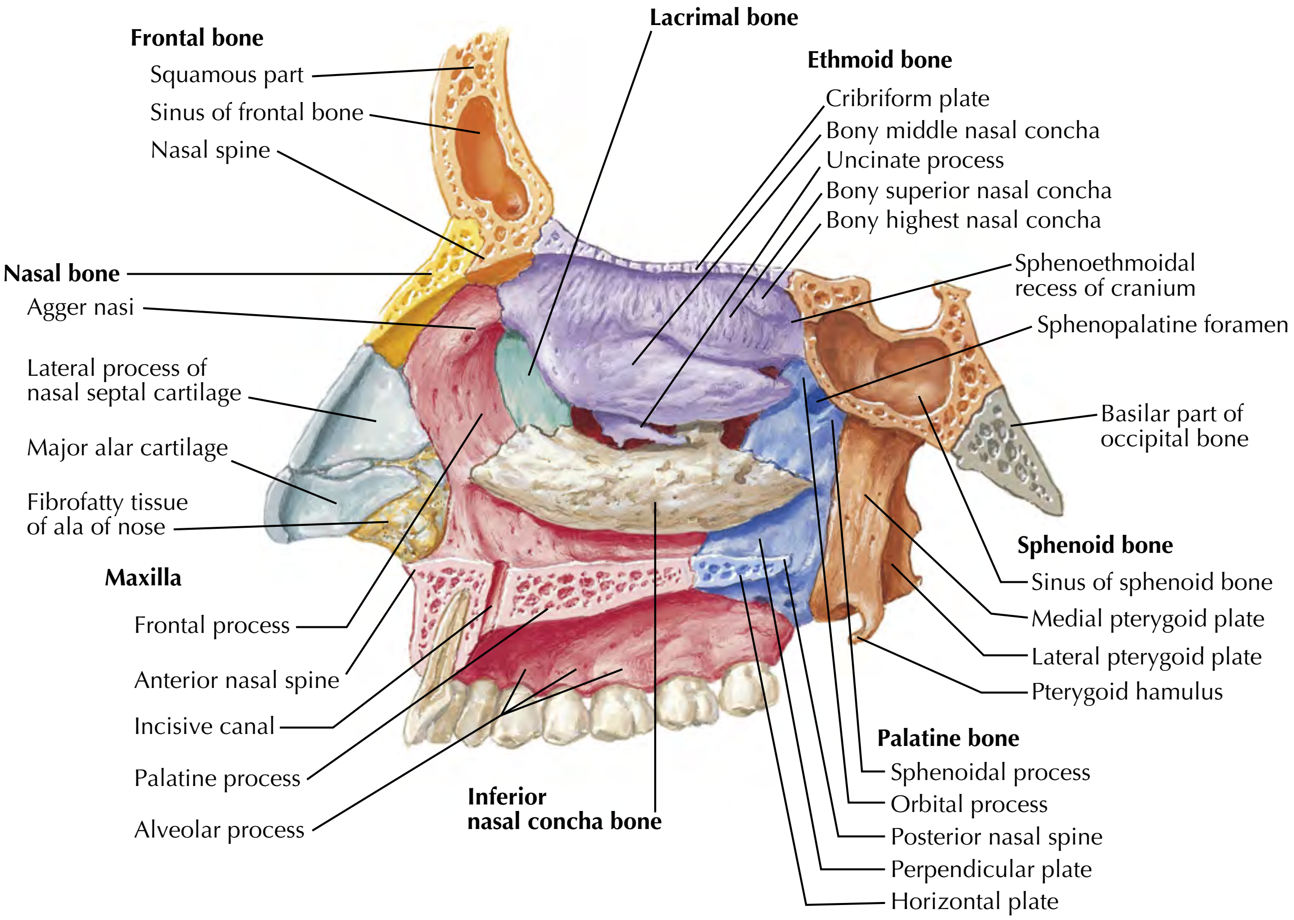

Middle nasal concha
Middle nasal meatus
Choana
Inferior nasal concha
Inferior nasal meatus

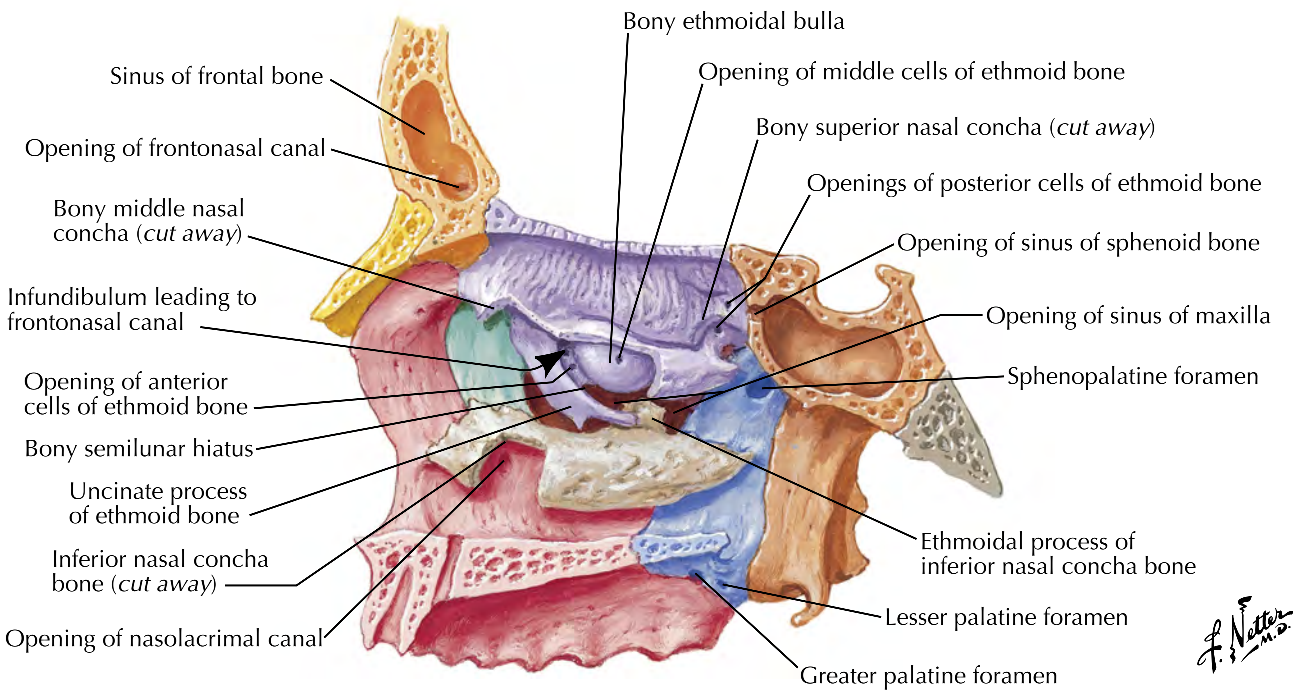
Inferior view with speculum in place


Frontal sinus
Probe passing from semilunar hiatus into frontal sinus via frontonasal duct
Middle nasal concha (*cut surface*)
Ethmoidal bulla
Openings of middle ethmoidal cells
Semilunar hiatus (with opening of anterior ethmoidal cells)
Uncinate process of ethmoid bone
Inferior nasal concha (*cut surface*)
Opening of nasolacrimal duct
Inferior nasal meatus
Opening of maxillary sinus
Cribriform plate of ethmoid bone
Probe in opening of sphenoidal sinus
Sphenoidal sinus
Superior nasal meatus (with opening of posterior ethmoidal cells)
Basilar part of occipital bone
Torus tubarius
Pharyngeal opening of auditory tube

Lateral Wall of Nasal Cavity of Cranium

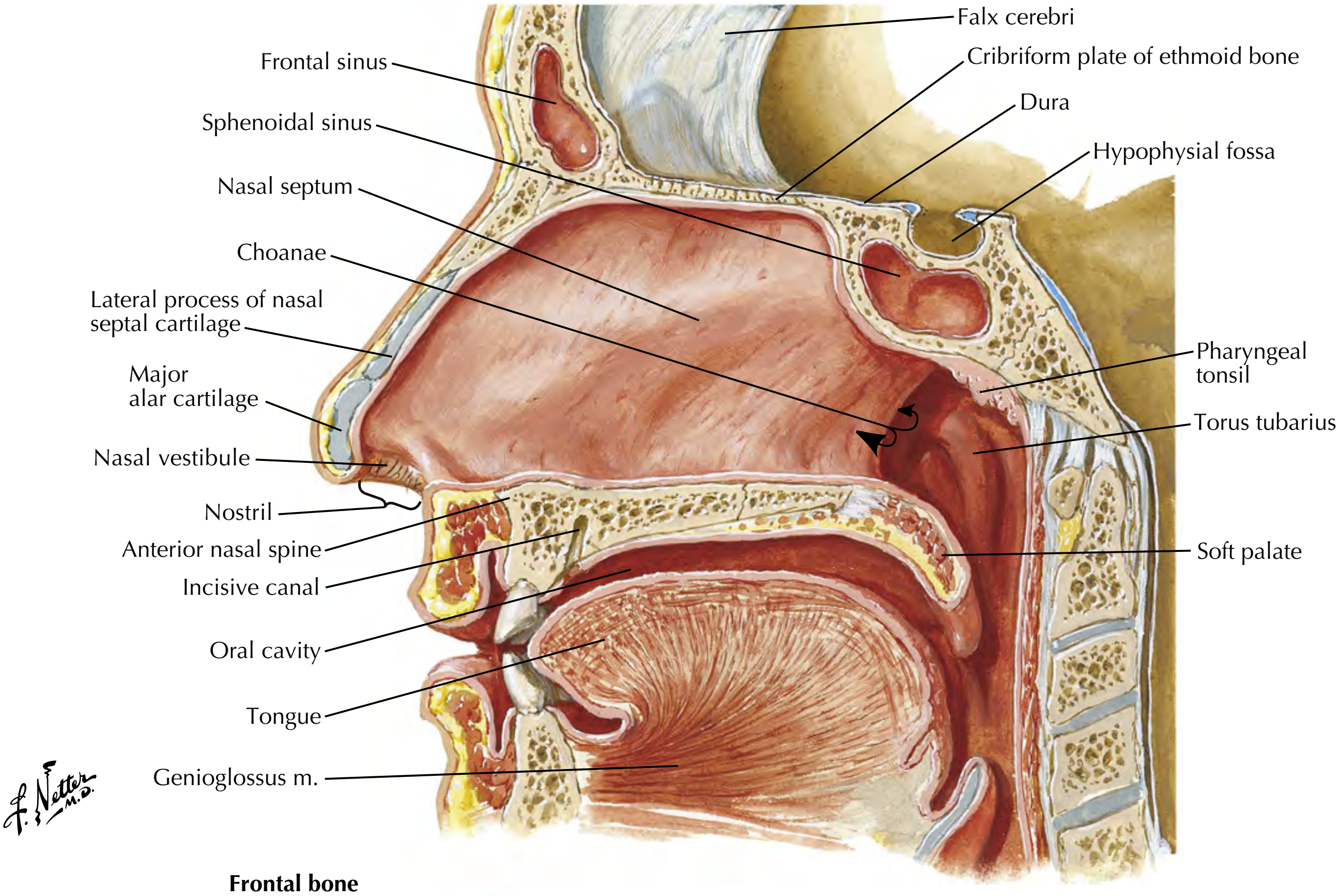
See also **Plates 61, 63**

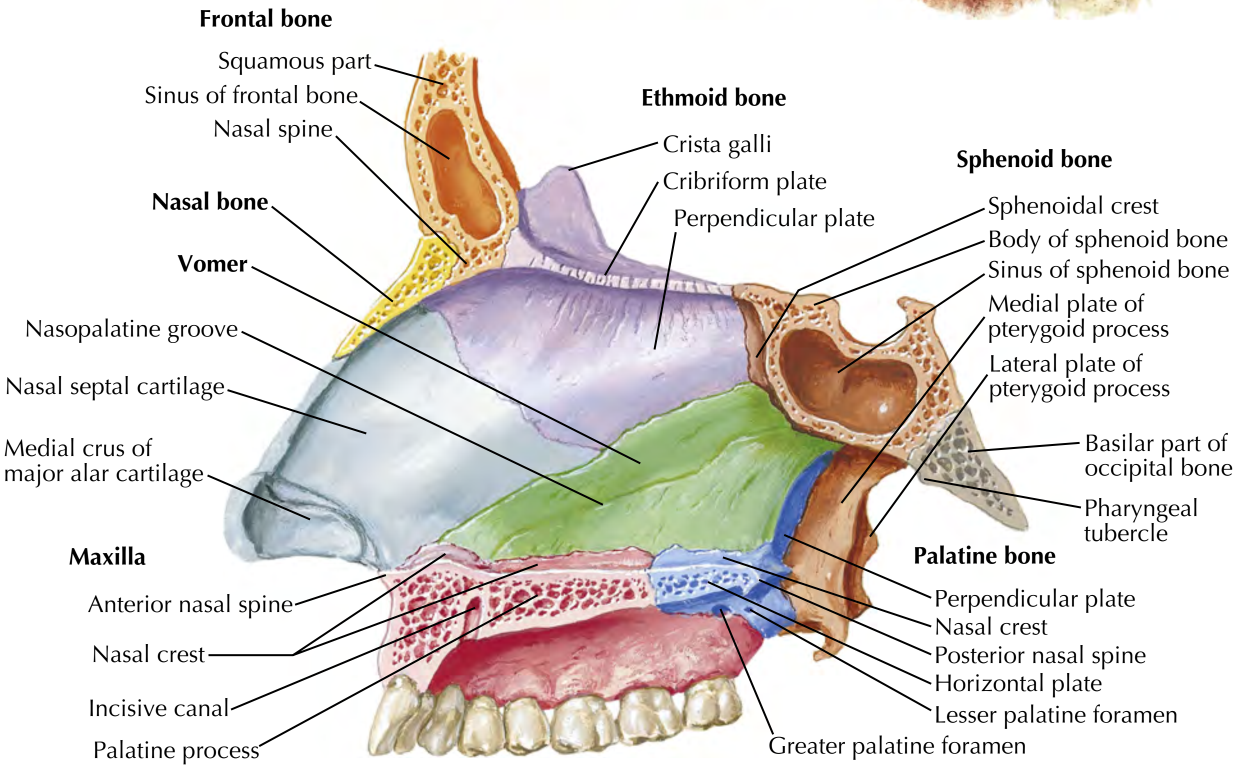

Frontal bone
Squamous part
Sinus of frontal bone
Nasal spine
Nasal bone
Agger nasi
Lateral process of nasal septal cartilage
Major alar cartilage
Fibrofatty tissue of ala of nose
Maxilla
Frontal process
Anterior nasal spine
Incisive canal
Palatine process
Alveolar process
Inferior nasal concha bone
Lacrimal bone
Ethmoid bone
Cribriform plate
Bony middle nasal concha
Uncinate process
Bony superior nasal concha
Bony highest nasal concha
Sphenoethmoidal recess of cranium
Sphenopalatine foramen
Basilar part of occipital bone
Sphenoid bone
Sinus of sphenoid bone
Medial pterygoid plate
Lateral pterygoid plate
Pterygoid hamulus
Palatine bone
Sphenoidal process
Orbital process
Posterior nasal spine
Perpendicular plate
Horizontal plate


Sinus of frontal bone
Opening of frontonasal canal
Bony middle nasal concha (*cut away*)
Infundibulum leading to frontonasal canal
Opening of anterior cells of ethmoid bone
Bony semilunar hiatus
Uncinate process of ethmoid bone
Inferior nasal concha bone (*cut away*)
Opening of nasolacrimal canal
Bony ethmoidal bulla
Opening of middle cells of ethmoid bone
Bony superior nasal concha (*cut away*)
Openings of posterior cells of ethmoid bone
Opening of sinus of sphenoid bone
Opening of sinus of maxilla
Sphenopalatine foramen
Ethmoidal process of inferior nasal concha bone
Lesser palatine foramen
Greater palatine foramen

Medial Wall of Nasal Cavity (Nasal Septum)

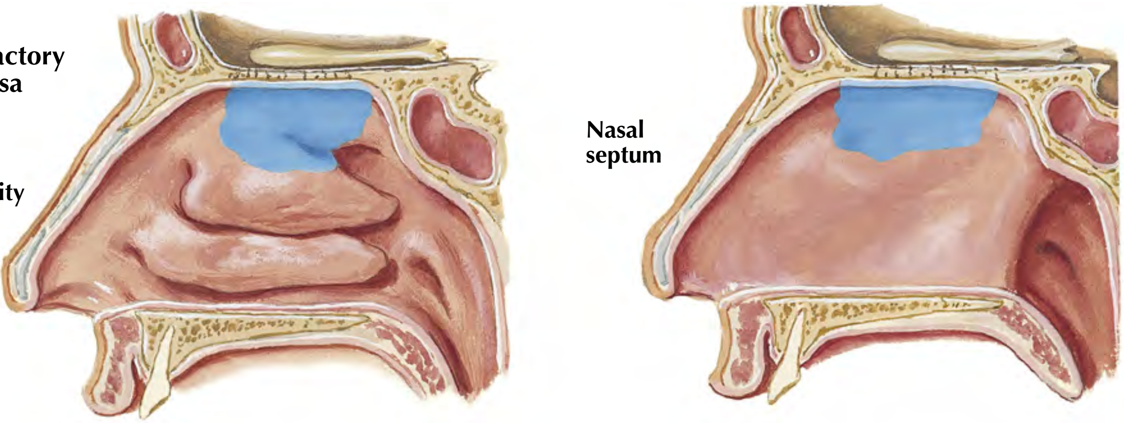
See also **Plate 29**


Falx cerebri
Frontal sinus
Cribriform plate of ethmoid bone
Dura
Sphenoidal sinus
Hypophysial fossa
Nasal septum
Choanae
Lateral process of nasal septal cartilage
Major alar cartilage
Pharyngeal tonsil
Torus tubarius
Nasal vestibule
Nostril
Anterior nasal spine
Soft palate
Incisive canal
Oral cavity
Tongue
Genioglossus m.
f. Netter M.D.


Frontal bone
Squamous part
Sinus of frontal bone
Nasal spine
Ethmoid bone
Crista galli
Cribriform plate
Perpendicular plate
Sphenoid bone
Sphenoidal crest
Body of sphenoid bone
Sinus of sphenoid bone
Medial plate of pterygoid process
Lateral plate of pterygoid process
Nasal bone
Vomer
Nasopalatine groove
Nasal septal cartilage
Medial crus of major alar cartilage
Basilar part of occipital bone
Pharyngeal tubercle
Maxilla
Palatine bone
Anterior nasal spine
Nasal crest
Incisive canal
Palatine process
Perpendicular plate
Nasal crest
Posterior nasal spine
Horizontal plate
Lesser palatine foramen
Greater palatine foramen

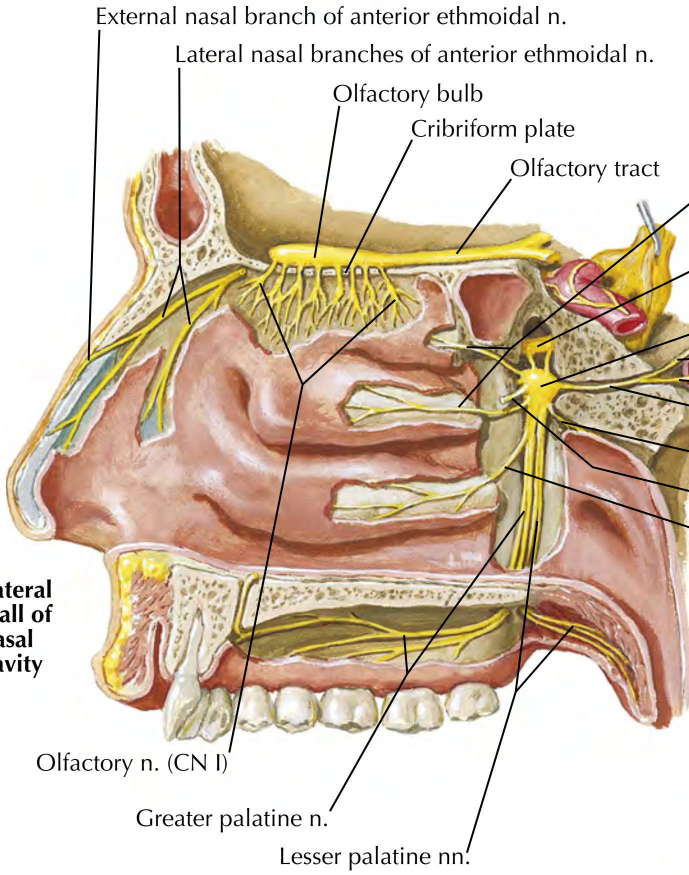
See also **Plates 40, 81, 146**

Distribution of olfactory part of nasal mucosa (*shaded blue*)

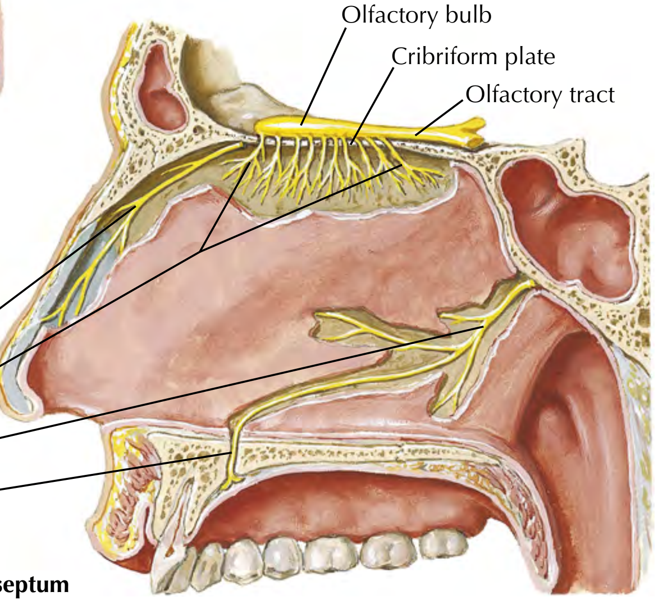


Lateral wall of nasal cavity

Nasal septum

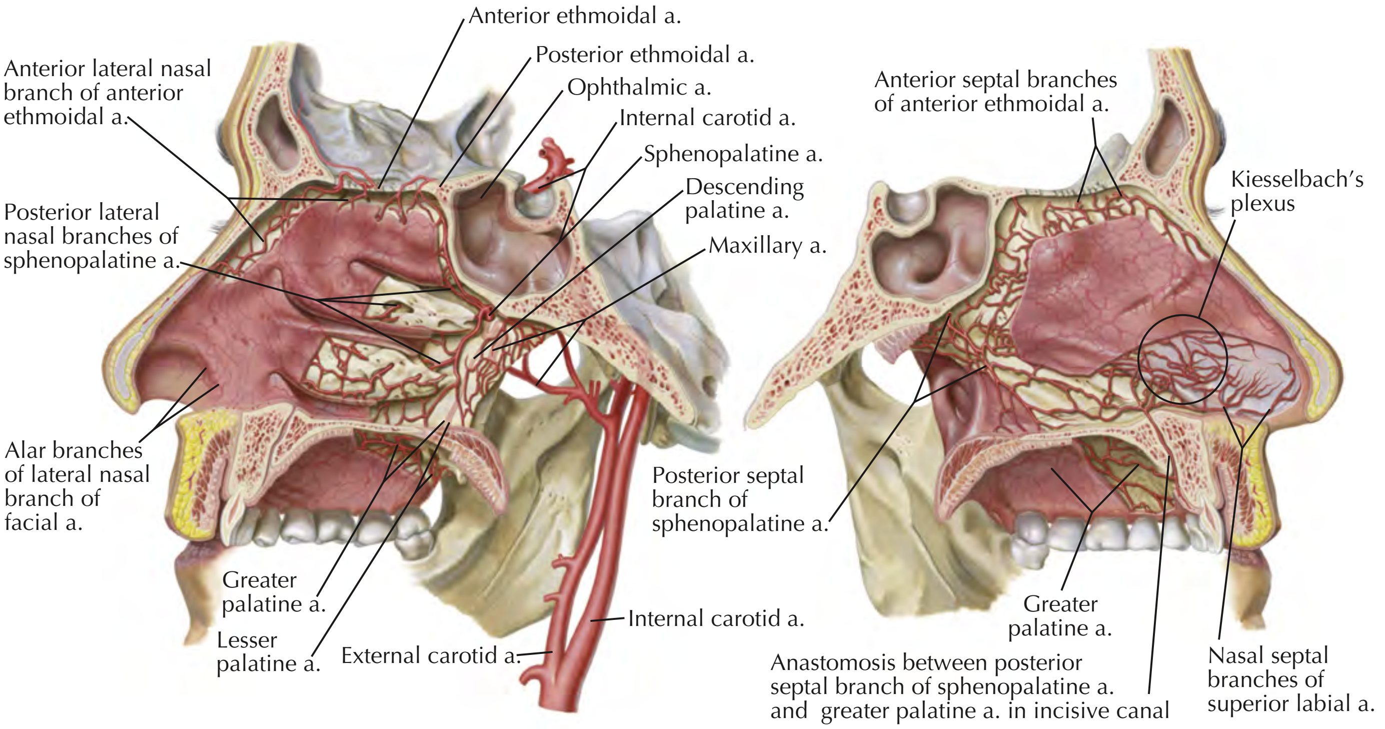

External nasal branch of anterior ethmoidal n.
Lateral nasal branches of anterior ethmoidal n.
Olfactory bulb
Cribriform plate
Olfactory tract
Lateral superior posterior nasal branches of maxillary n.
Maxillary n. (CN V_2) (sphenopalatine foramen dissected away)
Pterygopalatine ganglion
Greater petrosal n.
Deep petrosal n.
Nerve of pterygoid canal (Vidian n.)
Pharyngeal n.
Nasopalatine n. (*cut*)
Inferior posterior nasal branch of greater palatine n.
Olfactory n. (CN I)
Greater palatine n.
Lesser palatine nn.

Lateral wall of nasal cavity


Olfactory bulb
Cribriform plate
Olfactory tract
Medial nasal branch of anterior ethmoidal n.
Olfactory n. (CN I)
Nasopalatine n.
Incisive canal

Nasal septum

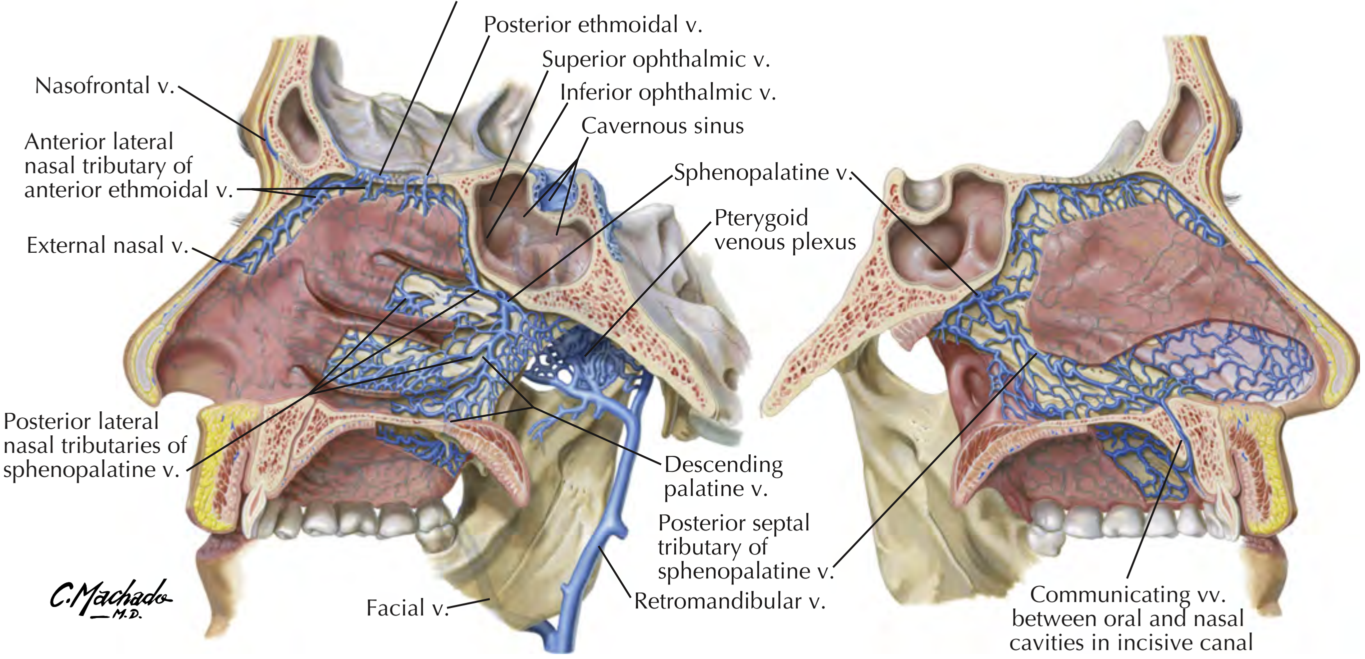
Vasculature of Nasal Cavity



Lateral wall of nasal cavity

Nasal septum

Anterior ethmoidal a.
Posterior ethmoidal a.
Ophthalmic a.
Internal carotid a.
Sphenopalatine a.
Descending palatine a.
Maxillary a.
Anterior lateral nasal branch of anterior ethmoidal a.
Posterior lateral nasal branches of sphenopalatine a.
Alar branches of lateral nasal branch of facial a.
Greater palatine a.
Lesser palatine a.
External carotid a.
Internal carotid a.
Posterior septal branch of sphenopalatine a.
Anterior septal branches of anterior ethmoidal a.
Kiesselbach's plexus
Greater palatine a.
Anastomosis between posterior septal branch of sphenopalatine a. and greater palatine a. in incisive canal
Nasal septal branches of superior labial a.



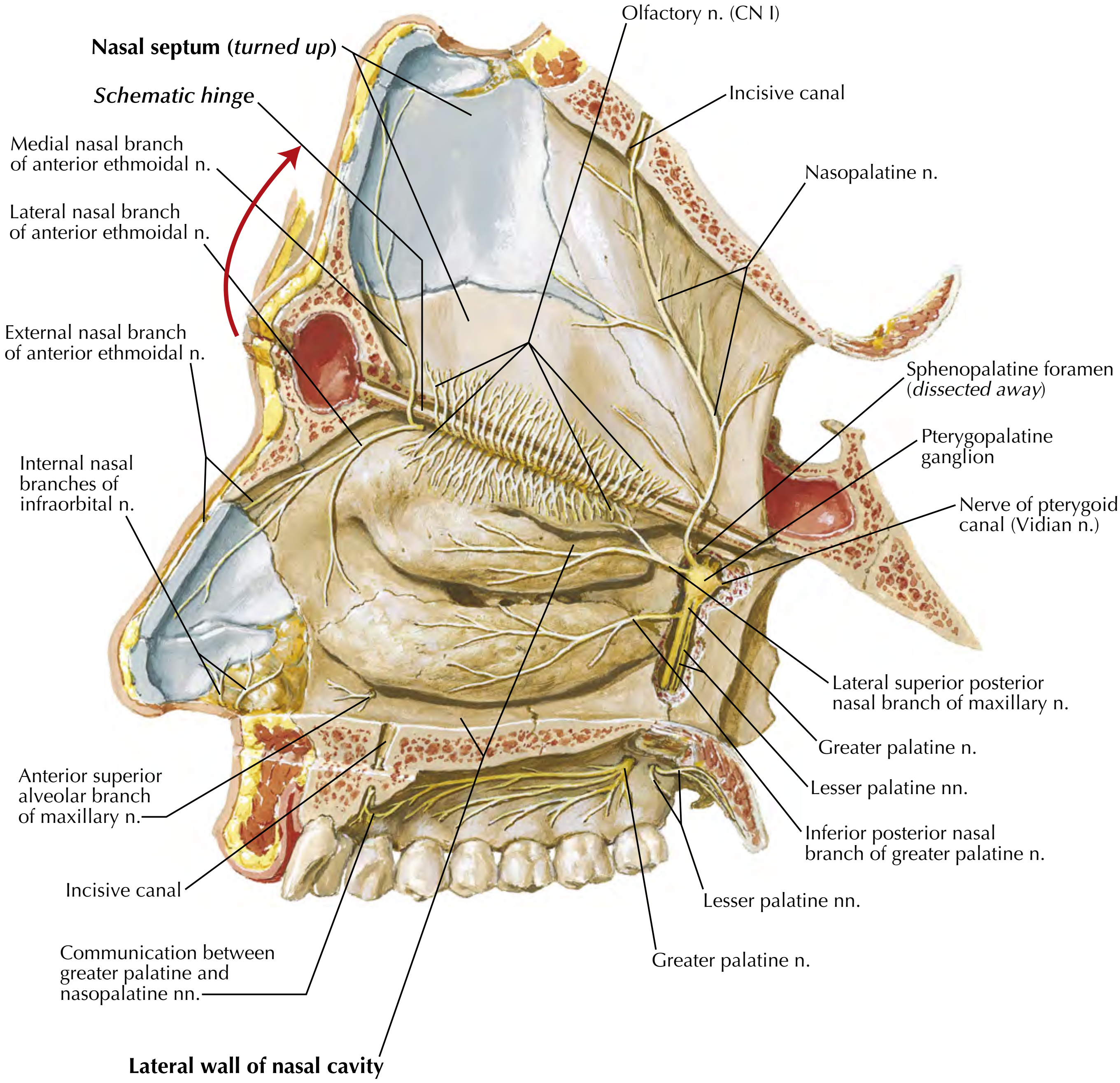
Lateral wall of nasal cavity

Nasal septum

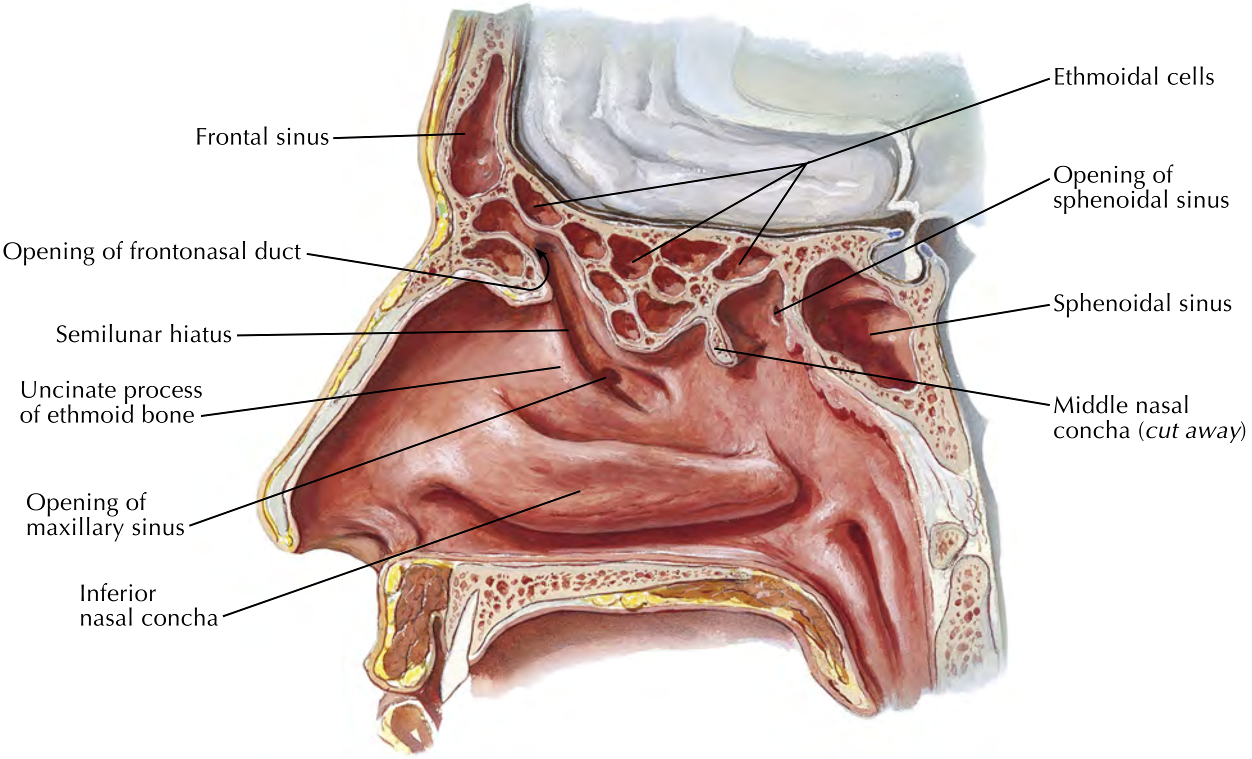
Anterior ethmoidal v.
Posterior ethmoidal v.
Superior ophthalmic v.
Inferior ophthalmic v.
Cavernous sinus
Sphenopalatine v.
Pterygoid venous plexus
Nasofrontal v.
Anterior lateral nasal tributary of anterior ethmoidal v.
External nasal v.
Posterior lateral nasal tributaries of sphenopalatine v.
Descending palatine v.
Posterior septal tributary of sphenopalatine v.
Retromandibular v.
Facial v.
Communicating vv. between oral and nasal cavities in incisive canal
C.Machado M.D.

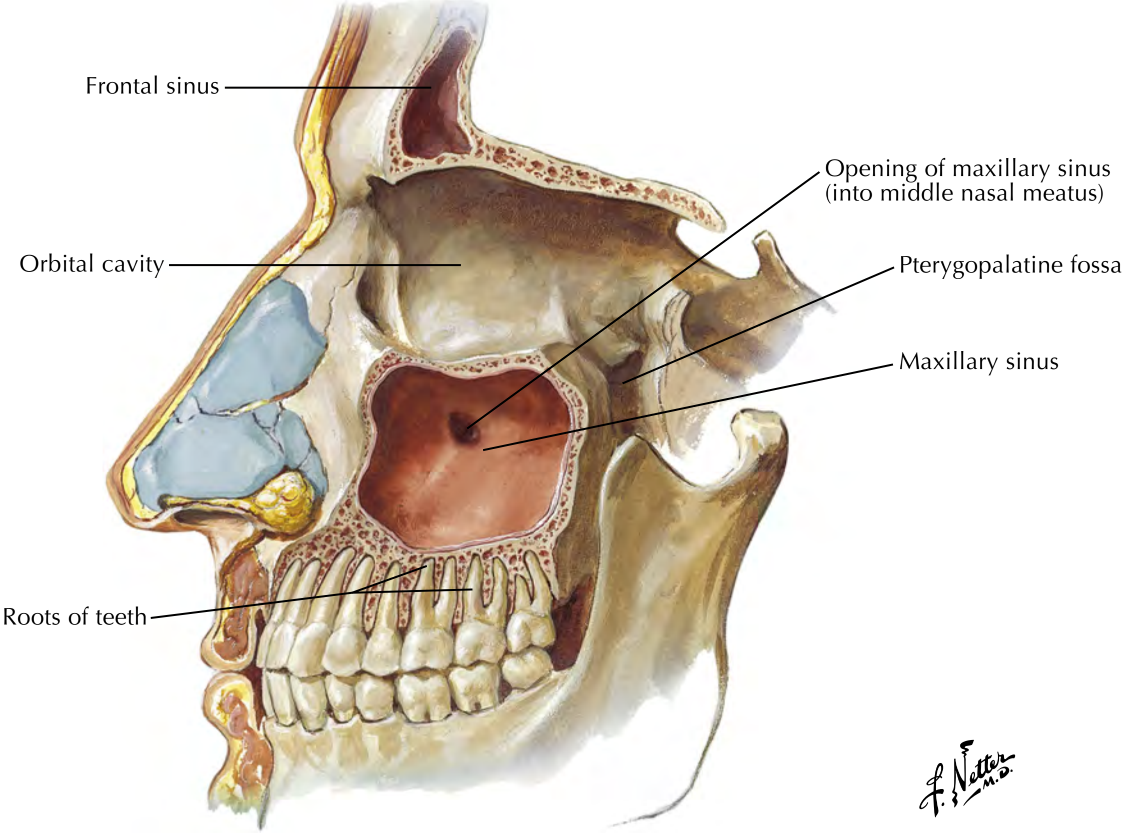
Nerves of Nasal Cavity: Bony Nasal Septum Turned Up

See also **Plate 80**

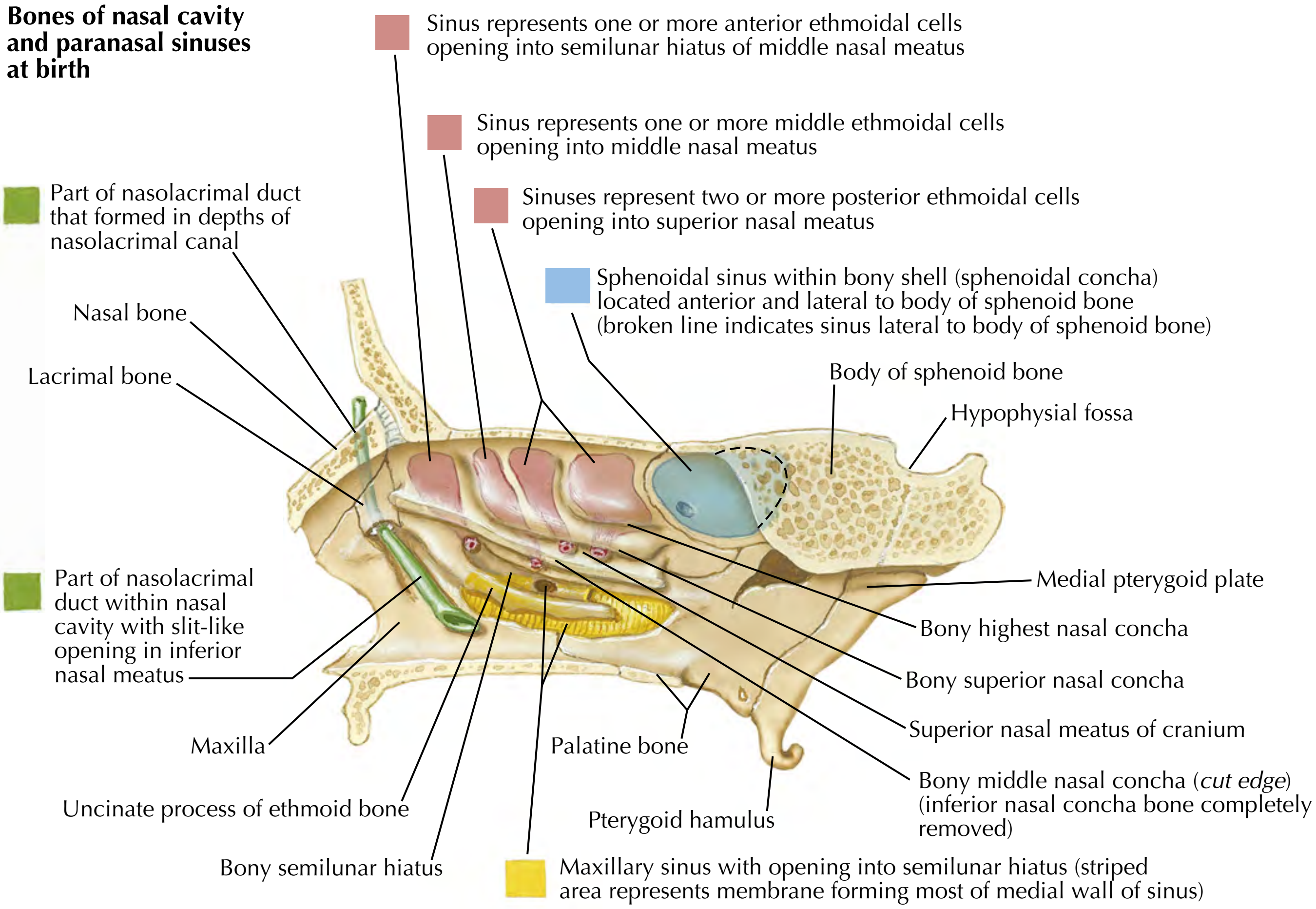

Nasal septum (*turned up*)
Schematic hinge
Medial nasal branch of anterior ethmoidal n.
Lateral nasal branch of anterior ethmoidal n.
External nasal branch of anterior ethmoidal n.
Internal nasal branches of infraorbital n.
Anterior superior alveolar branch of maxillary n.
Incisive canal
Communication between greater palatine and nasopalatine nn.
Lateral wall of nasal cavity
Olfactory n. (CN I)
Incisive canal
Nasopalatine n.
Sphenopalatine foramen (*dissected away*)
Pterygopalatine ganglion
Nerve of pterygoid canal (Vidian n.)
Lateral superior posterior nasal branch of maxillary n.
Greater palatine n.
Lesser palatine nn.
Inferior posterior nasal branch of greater palatine n.
Lesser palatine nn.
Greater palatine n.

See also **Plate 61**


Frontal sinus
Opening of frontonasal duct
Semilunar hiatus
Uncinate process of ethmoid bone
Opening of maxillary sinus
Inferior nasal concha
Ethmoidal cells
Opening of sphenoidal sinus
Sphenoidal sinus
Middle nasal concha (*cut away*)

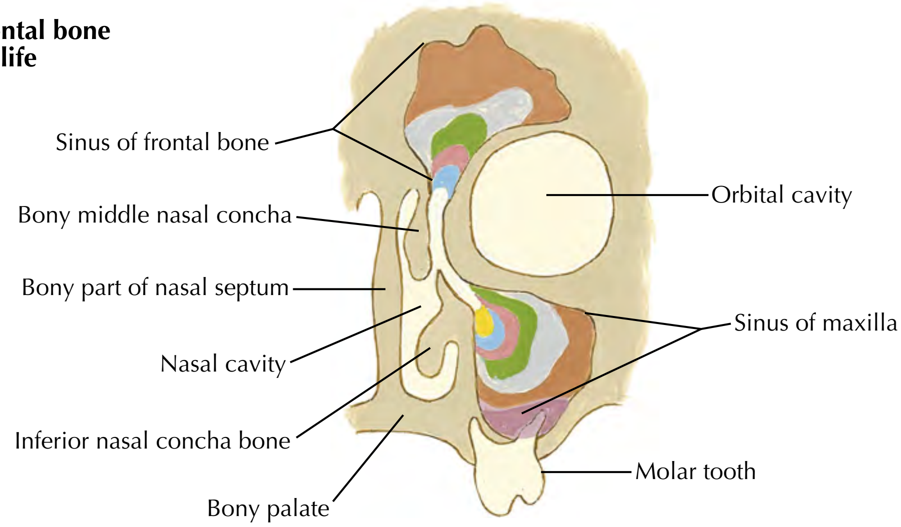

Frontal sinus
Orbital cavity
Roots of teeth
Opening of maxillary sinus (into middle nasal meatus)
Pterygopalatine fossa
Maxillary sinus

Bones of nasal cavity and paranasal sinuses at birth


🟥 Sinus represents one or more anterior ethmoidal cells opening into semilunar hiatus of middle nasal meatus
🟥 Sinus represents one or more middle ethmoidal cells opening into middle nasal meatus
🟥 Sinuses represent two or more posterior ethmoidal cells opening into superior nasal meatus
🟦 Sphenoidal sinus within bony shell (sphenoidal concha) located anterior and lateral to body of sphenoid bone (broken line indicates sinus lateral to body of sphenoid bone)
🟩 Part of nasolacrimal duct that formed in depths of nasolacrimal canal
Nasal bone
Lacrimal bone
Body of sphenoid bone
Hypophysial fossa
🟩 Part of nasolacrimal duct within nasal cavity with slit-like opening in inferior nasal meatus
Medial pterygoid plate
Bony highest nasal concha
Bony superior nasal concha
Superior nasal meatus of cranium
Maxilla
Palatine bone
Bony middle nasal concha (*cut edge*) (inferior nasal concha bone completely removed)
Uncinate process of ethmoid bone
Pterygoid hamulus
Bony semilunar hiatus
🟨 Maxillary sinus with opening into semilunar hiatus (striped area represents membrane forming most of medial wall of sinus)

Growth of sinuses in frontal bone and maxilla throughout life

🟨 Birth
🟦 1 year
🟥 4 years
🟩 7 years
⬜ 12 years
🟫 Adult
🟪 Old age

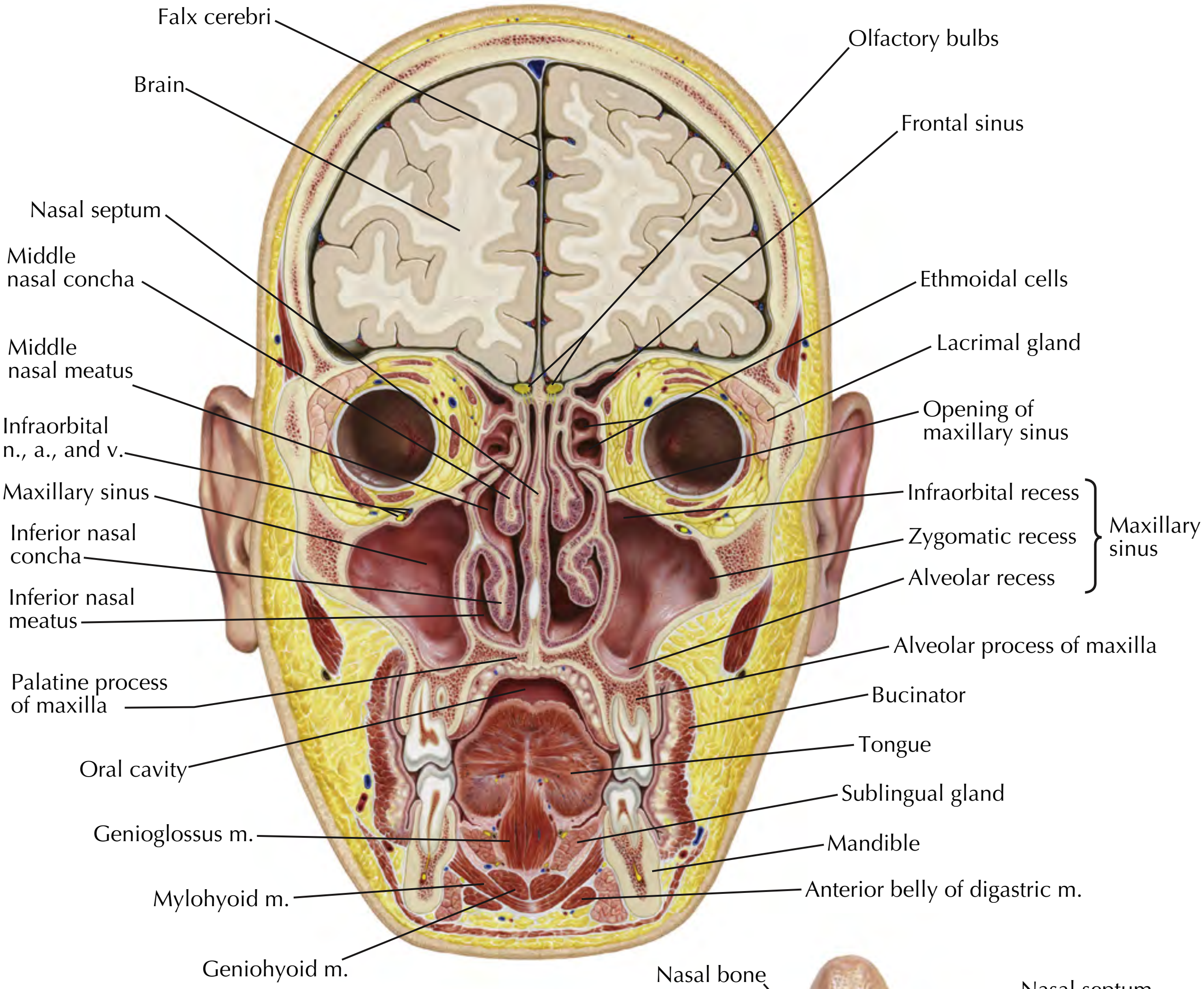

Sinus of frontal bone
Orbital cavity
Bony middle nasal concha
Bony part of nasal septum
Sinus of maxilla
Nasal cavity
Inferior nasal concha bone
Molar tooth
Bony palate

F. Netter M.D.

Paranasal Sinuses: Coronal and Transverse Sections

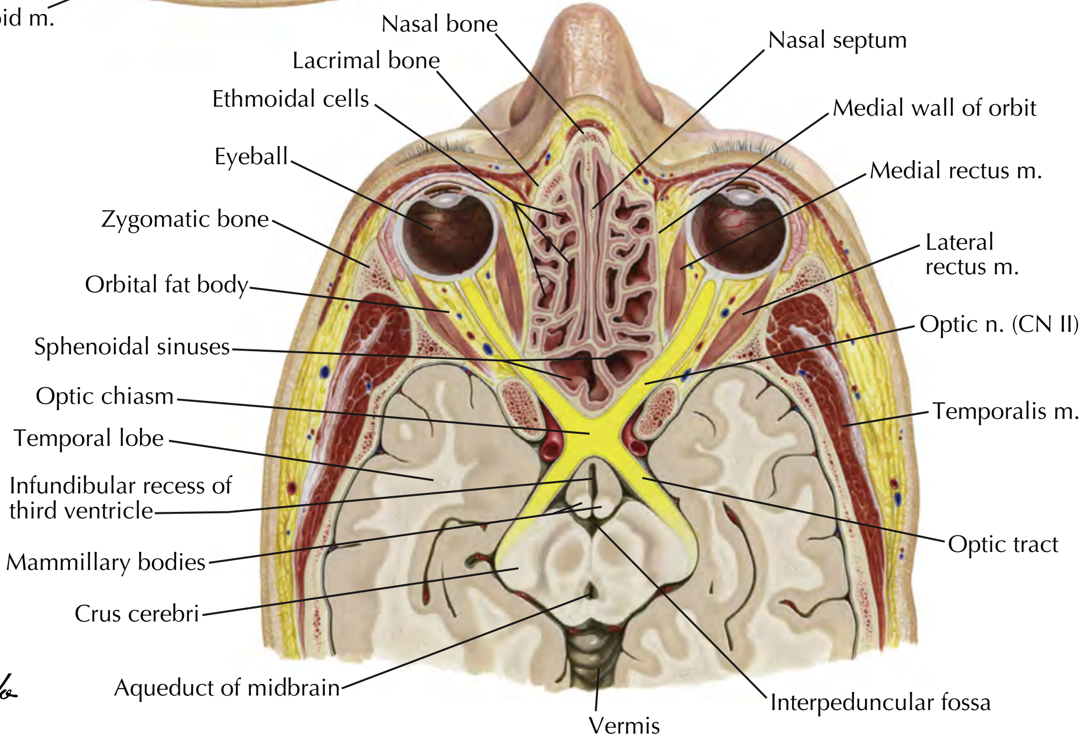
See also **Plates BP 22, BP 23**

Coronal section



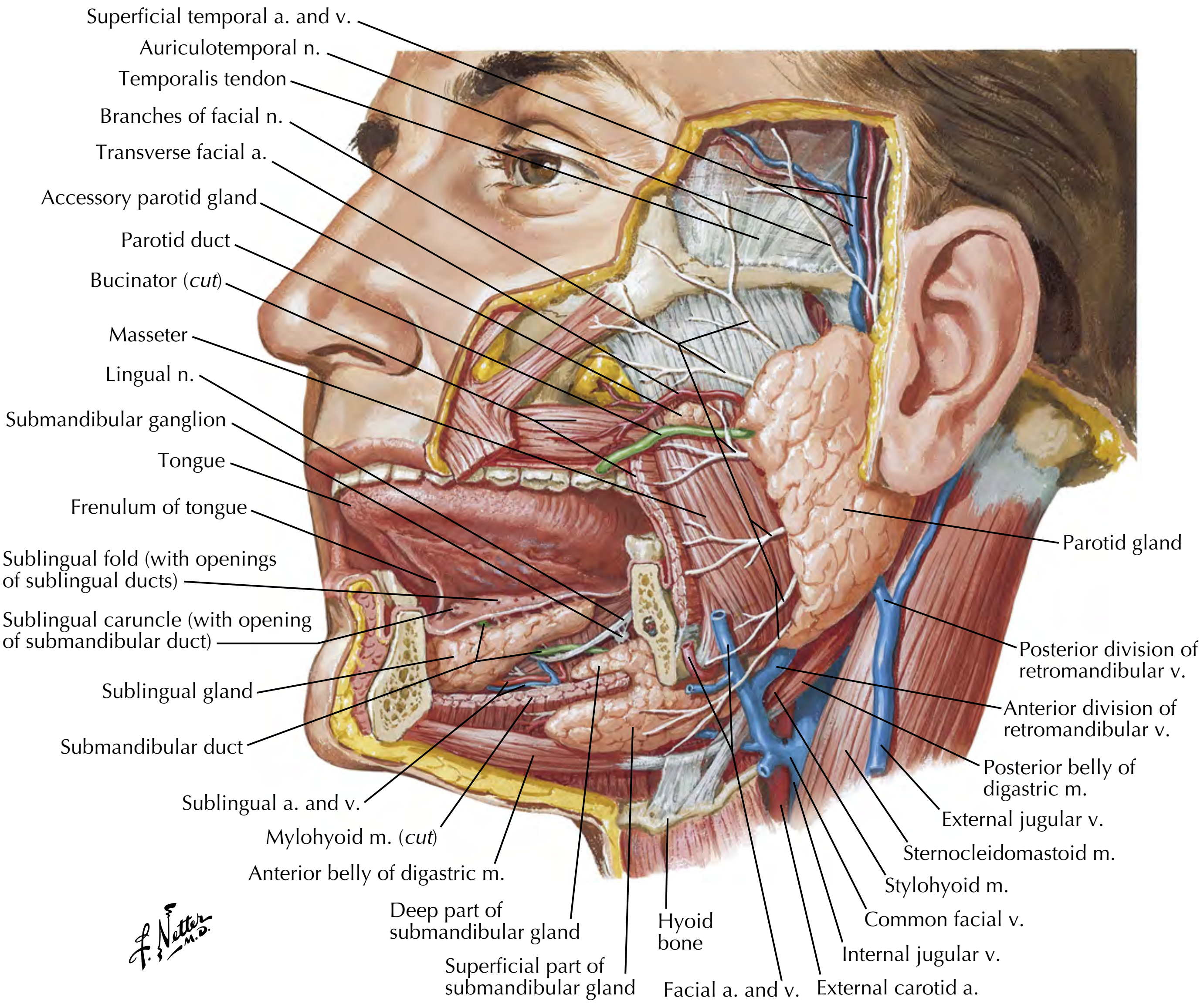
Falx cerebri
Brain
Nasal septum
Middle nasal concha
Middle nasal meatus
Infraorbital n., a., and v.
Maxillary sinus
Inferior nasal concha
Inferior nasal meatus
Palatine process of maxilla
Oral cavity
Genioglossus m.
Mylohyoid m.
Geniohyoid m.
Olfactory bulbs
Frontal sinus
Ethmoidal cells
Lacrimal gland
Opening of maxillary sinus
Infraorbital recess
Zygomatic recess
Alveolar recess
Maxillary sinus
Alveolar process of maxilla
Bucinator
Tongue
Sublingual gland
Mandible
Anterior belly of digastric m.

Transverse section



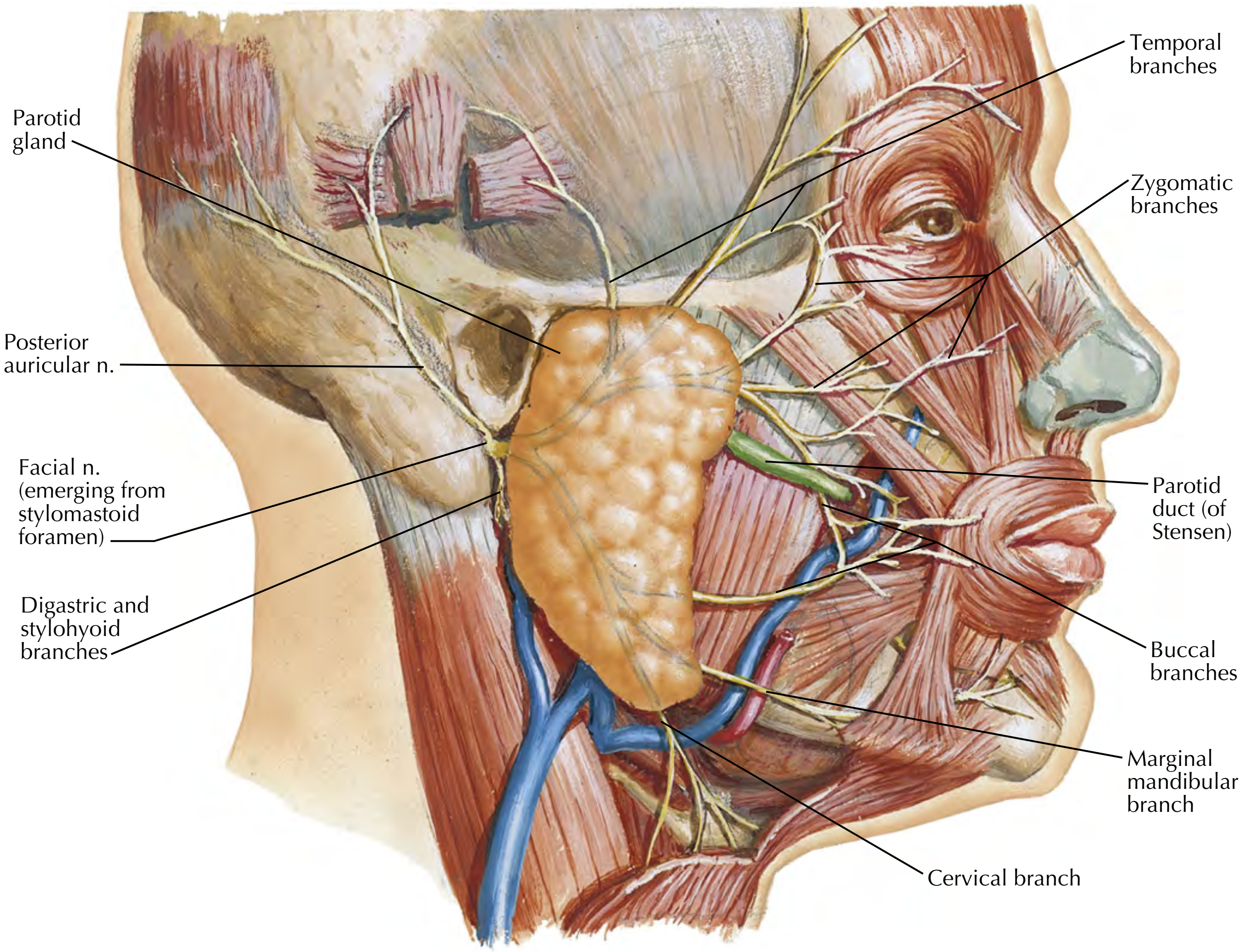
Nasal bone
Lacrimal bone
Ethmoidal cells
Eyeball
Zygomatic bone
Orbital fat body
Sphenoidal sinuses
Optic chiasm
Temporal lobe
Infundibular recess of third ventricle
Mammillary bodies
Crus cerebri
Aqueduct of midbrain
Vermis
Nasal septum
Medial wall of orbit
Medial rectus m.
Lateral rectus m.
Optic n. (CN II)
Temporalis m.
Optic tract
Interpeduncular fossa

C.Machado M.D.

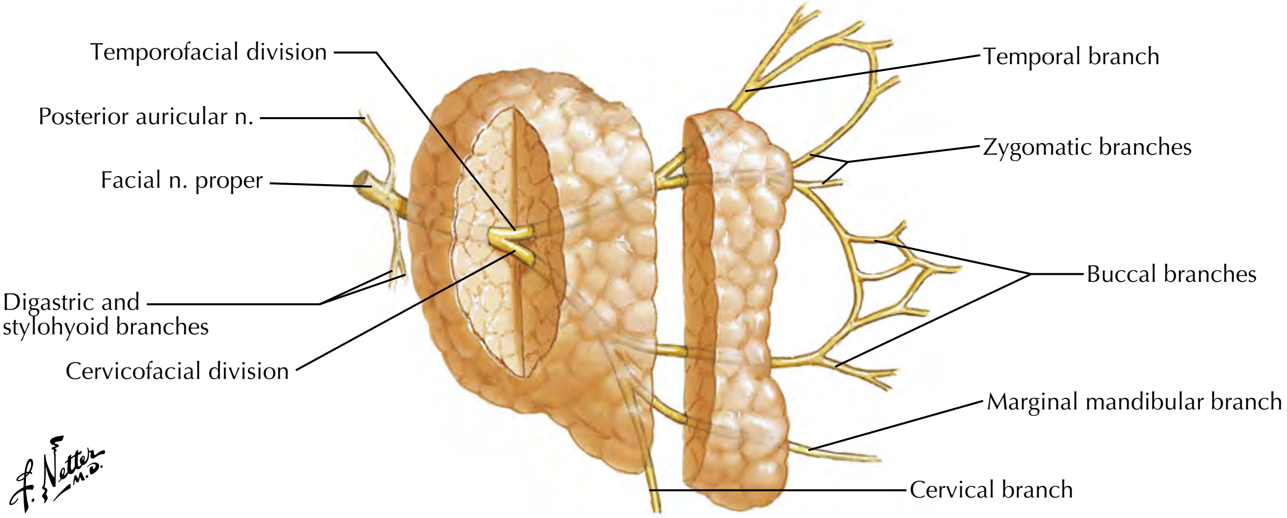

Superficial temporal a. and v.
Auriculotemporal n.
Temporalis tendon
Branches of facial n.
Transverse facial a.
Accessory parotid gland
Parotid duct
Bucinator (*cut*)
Masseter
Lingual n.
Submandibular ganglion
Tongue
Frenulum of tongue
Sublingual fold (with openings of sublingual ducts)
Sublingual caruncle (with opening of submandibular duct)
Sublingual gland
Submandibular duct
Sublingual a. and v.
Mylohyoid m. (*cut*)
Anterior belly of digastric m.
Deep part of submandibular gland
Superficial part of submandibular gland
Hyoid bone
Facial a. and v.
External carotid a.
Internal jugular v.
Common facial v.
Stylohyoid m.
Sternocleidomastoid m.
External jugular v.
Posterior belly of digastric m.
Anterior division of retromandibular v.
Posterior division of retromandibular v.
Parotid gland
F. Netter M.D.

Facial Nerve Branches and Parotid Gland

See also **Plates 70, 150**



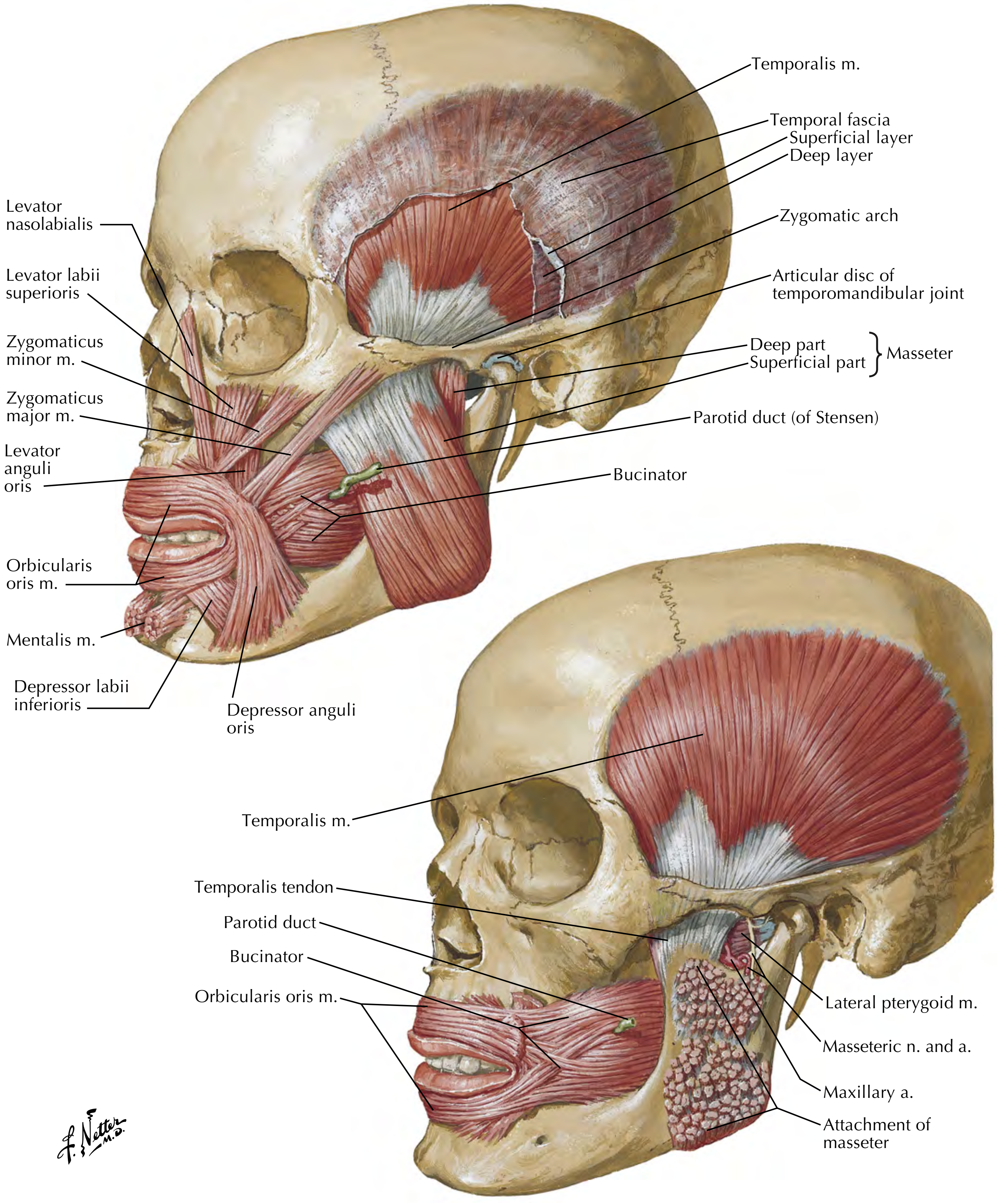
Parotid gland
Posterior auricular n.
Facial n. (emerging from stylomastoid foramen)
Digastric and stylohyoid branches
Temporal branches
Zygomatic branches
Parotid duct (of Stensen)
Buccal branches
Marginal mandibular branch
Cervical branch



Temporofacial division
Posterior auricular n.
Facial n. proper
Digastric and stylohyoid branches
Cervicofacial division
Temporal branch
Zygomatic branches
Buccal branches
Marginal mandibular branch
Cervical branch

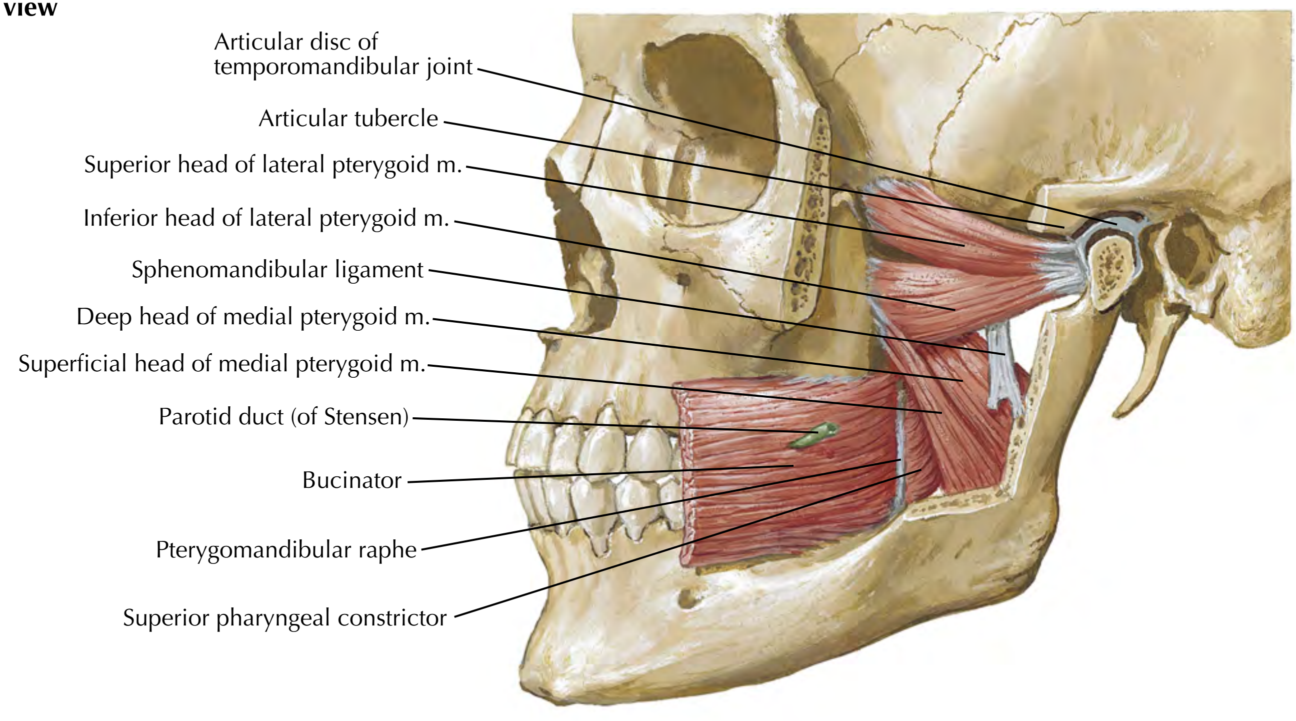
Muscles of Mastication: Masseter and Temporalis Muscle

For facial muscles see **Plates 48, BP 25**

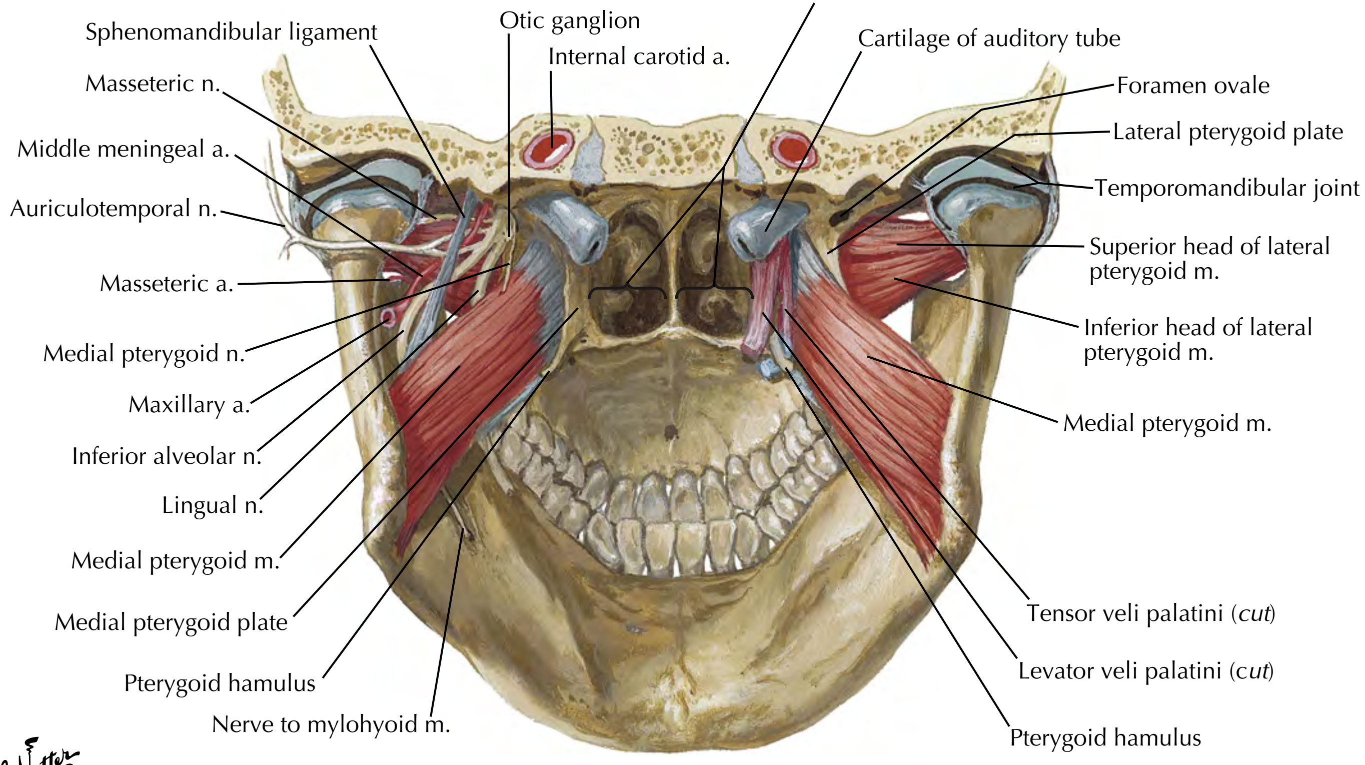

Levator nasolabialis
Levator labii superioris
Zygomaticus minor m.
Zygomaticus major m.
Levator anguli oris
Orbicularis oris m.
Mentalis m.
Depressor labii inferioris
Depressor anguli oris
Temporalis m.
Temporal fascia
Superficial layer
Deep layer
Zygomatic arch
Articular disc of temporomandibular joint
Deep part
Superficial part
Masseter
Parotid duct (of Stensen)
Bucinator
Temporalis m.
Temporalis tendon
Parotid duct
Bucinator
Orbicularis oris m.
Lateral pterygoid m.
Masseteric n. and a.
Maxillary a.
Attachment of masseter

See also **Plates 72, 77, BP 25**

Lateral view


Articular disc of temporomandibular joint
Articular tubercle
Superior head of lateral pterygoid m.
Inferior head of lateral pterygoid m.
Sphenomandibular ligament
Deep head of medial pterygoid m.
Superficial head of medial pterygoid m.
Parotid duct (of Stensen)
Bucinator
Pterygomandibular raphe
Superior pharyngeal constrictor

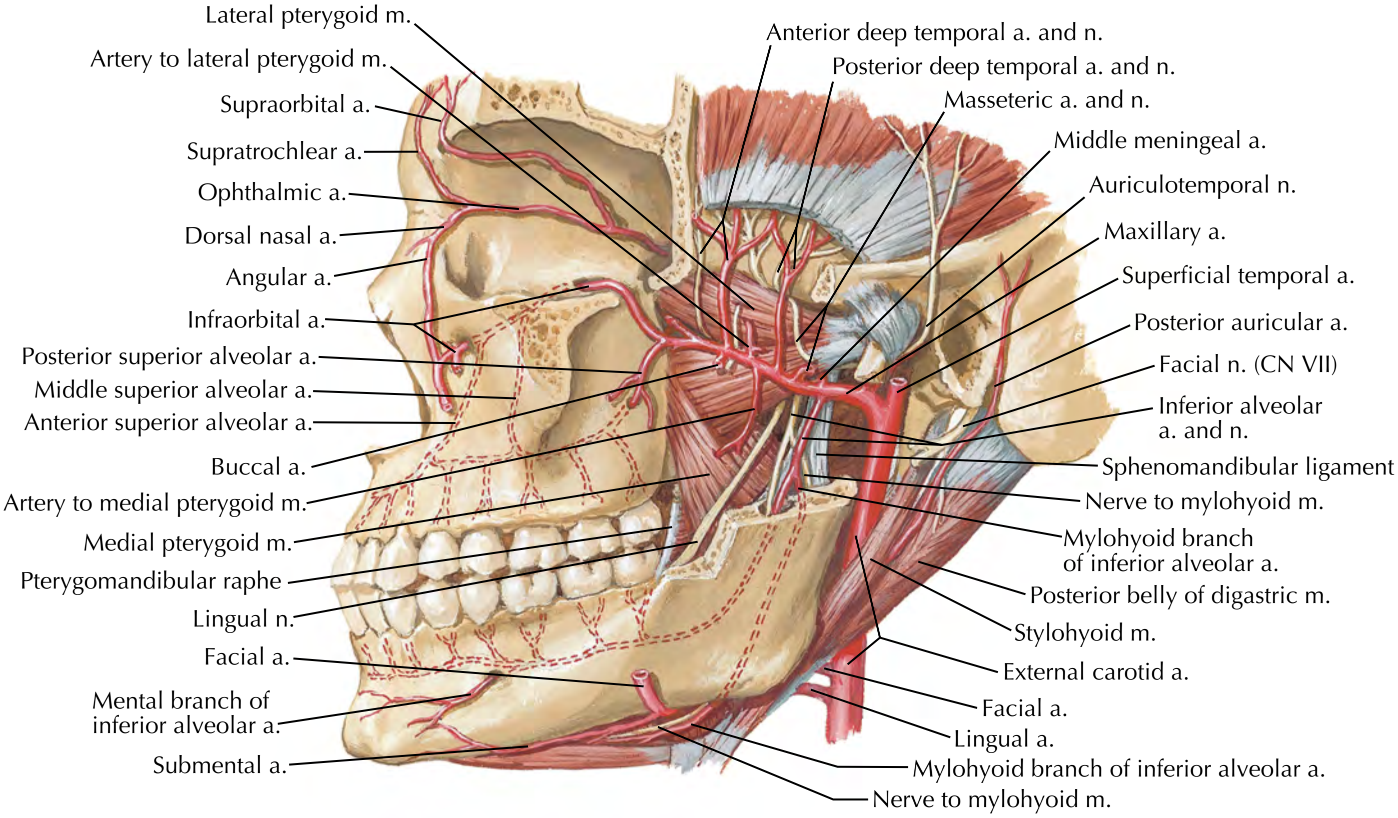
Posterior view

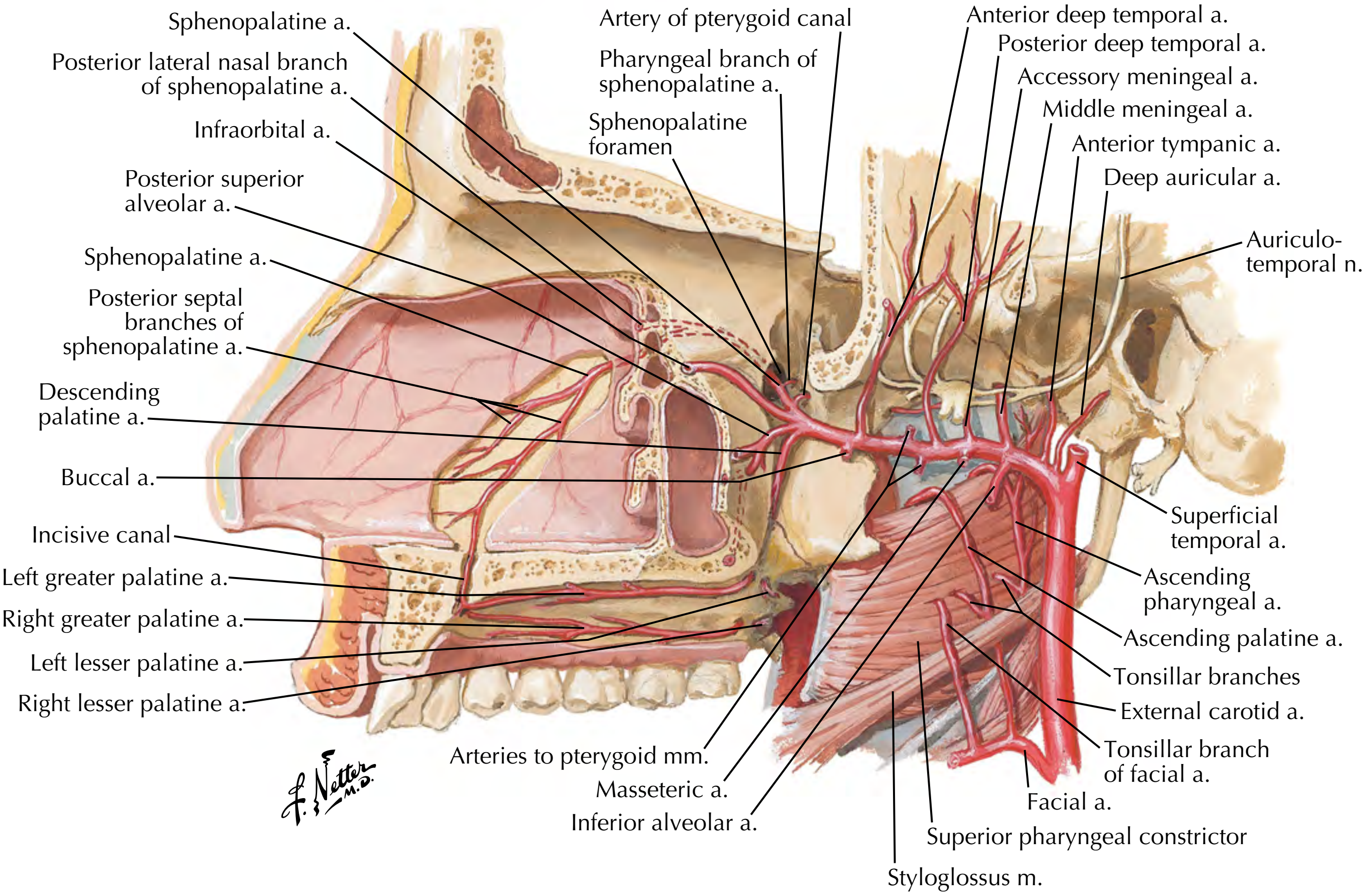

Sphenomandibular ligament
Otic ganglion
Internal carotid a.
Choanae of cranium
Cartilage of auditory tube
Masseteric n.
Middle meningeal a.
Auriculotemporal n.
Masseteric a.
Medial pterygoid n.
Maxillary a.
Inferior alveolar n.
Lingual n.
Medial pterygoid m.
Medial pterygoid plate
Pterygoid hamulus
Nerve to mylohyoid m.
Foramen ovale
Lateral pterygoid plate
Temporomandibular joint
Superior head of lateral pterygoid m.
Inferior head of lateral pterygoid m.
Medial pterygoid m.
Tensor veli palatini (*cut*)
Levator veli palatini (*cut*)
Pterygoid hamulus

F. Netter M.D.

Maxillary Artery

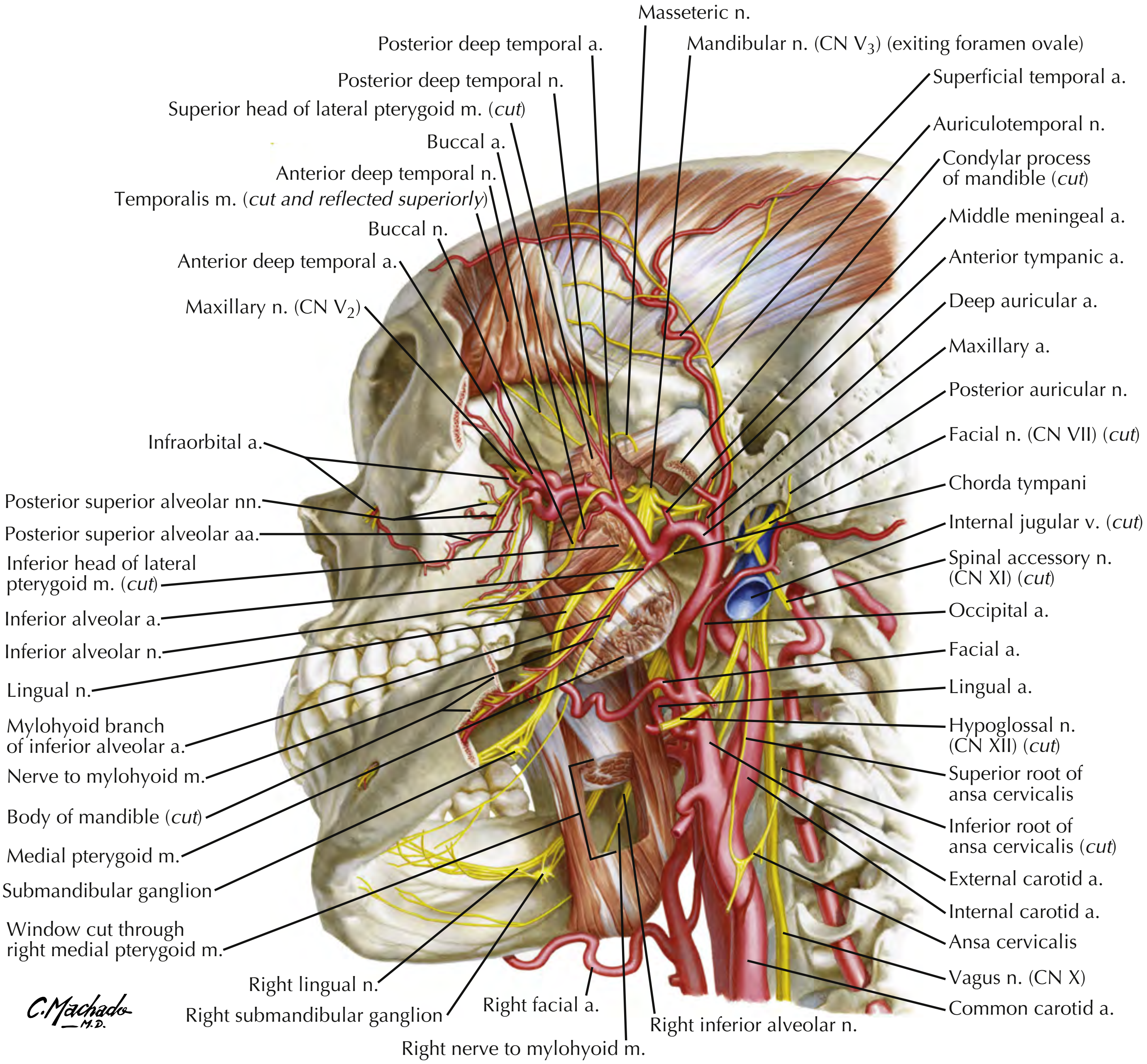
See also **Plates 81, 99**


Lateral pterygoid m.
Artery to lateral pterygoid m.
Supraorbital a.
Supratrochlear a.
Ophthalmic a.
Dorsal nasal a.
Angular a.
Infraorbital a.
Posterior superior alveolar a.
Middle superior alveolar a.
Anterior superior alveolar a.
Buccal a.
Artery to medial pterygoid m.
Medial pterygoid m.
Pterygomandibular raphe
Lingual n.
Facial a.
Mental branch of inferior alveolar a.
Submental a.
Anterior deep temporal a. and n.
Posterior deep temporal a. and n.
Masseteric a. and n.
Middle meningeal a.
Auriculotemporal n.
Maxillary a.
Superficial temporal a.
Posterior auricular a.
Facial n. (CN VII)
Inferior alveolar a. and n.
Sphenomandibular ligament
Nerve to mylohyoid m.
Mylohyoid branch of inferior alveolar a.
Posterior belly of digastric m.
Stylohyoid m.
External carotid a.
Facial a.
Lingual a.
Mylohyoid branch of inferior alveolar a.
Nerve to mylohyoid m.

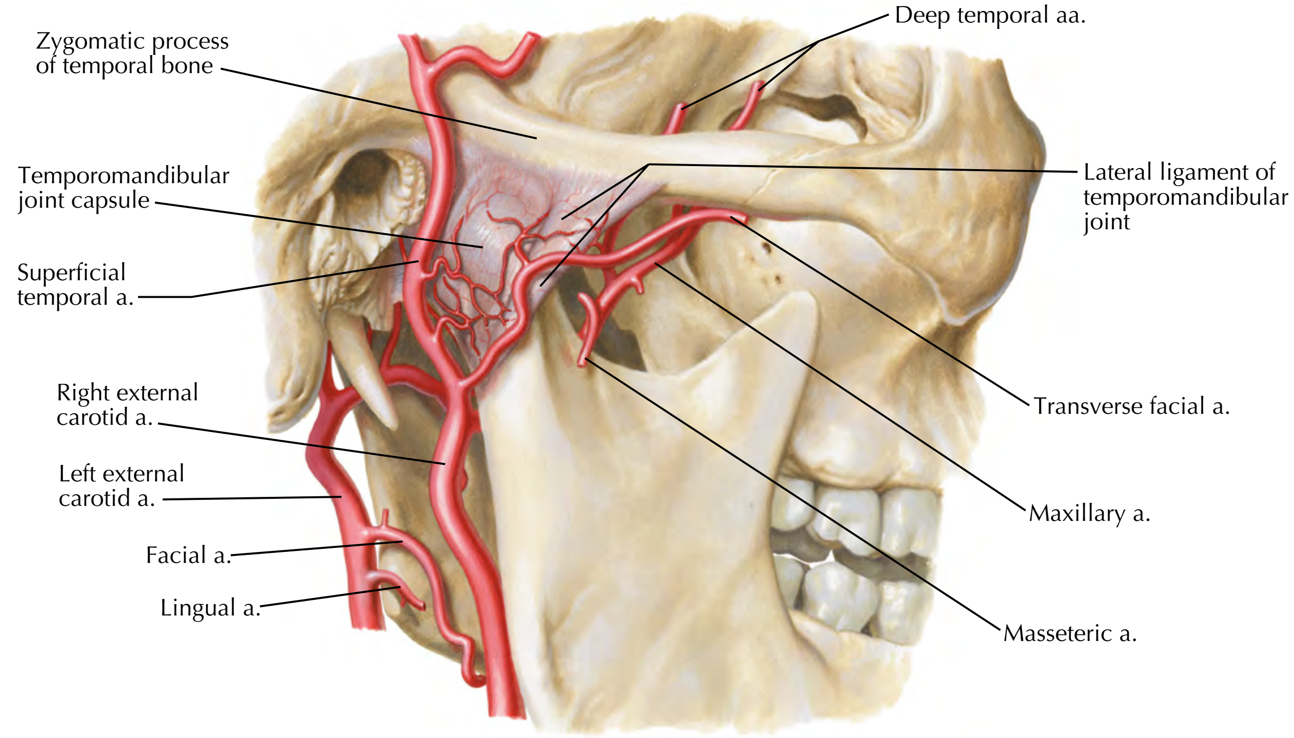

Sphenopalatine a.
Posterior lateral nasal branch of sphenopalatine a.
Infraorbital a.
Posterior superior alveolar a.
Sphenopalatine a.
Posterior septal branches of sphenopalatine a.
Descending palatine a.
Buccal a.
Incisive canal
Left greater palatine a.
Right greater palatine a.
Left lesser palatine a.
Right lesser palatine a.
Artery of pterygoid canal
Pharyngeal branch of sphenopalatine a.
Sphenopalatine foramen
Anterior deep temporal a.
Posterior deep temporal a.
Accessory meningeal a.
Middle meningeal a.
Anterior tympanic a.
Deep auricular a.
Auriculotemporal n.
Superficial temporal a.
Ascending pharyngeal a.
Ascending palatine a.
Tonsillar branches
External carotid a.
Tonsillar branch of facial a.
Facial a.
Superior pharyngeal constrictor
Styloglossus m.
Arteries to pterygoid mm.
Masseteric a.
Inferior alveolar a.
F. Netter M.D.

Temporal and Infratemporal Fossae

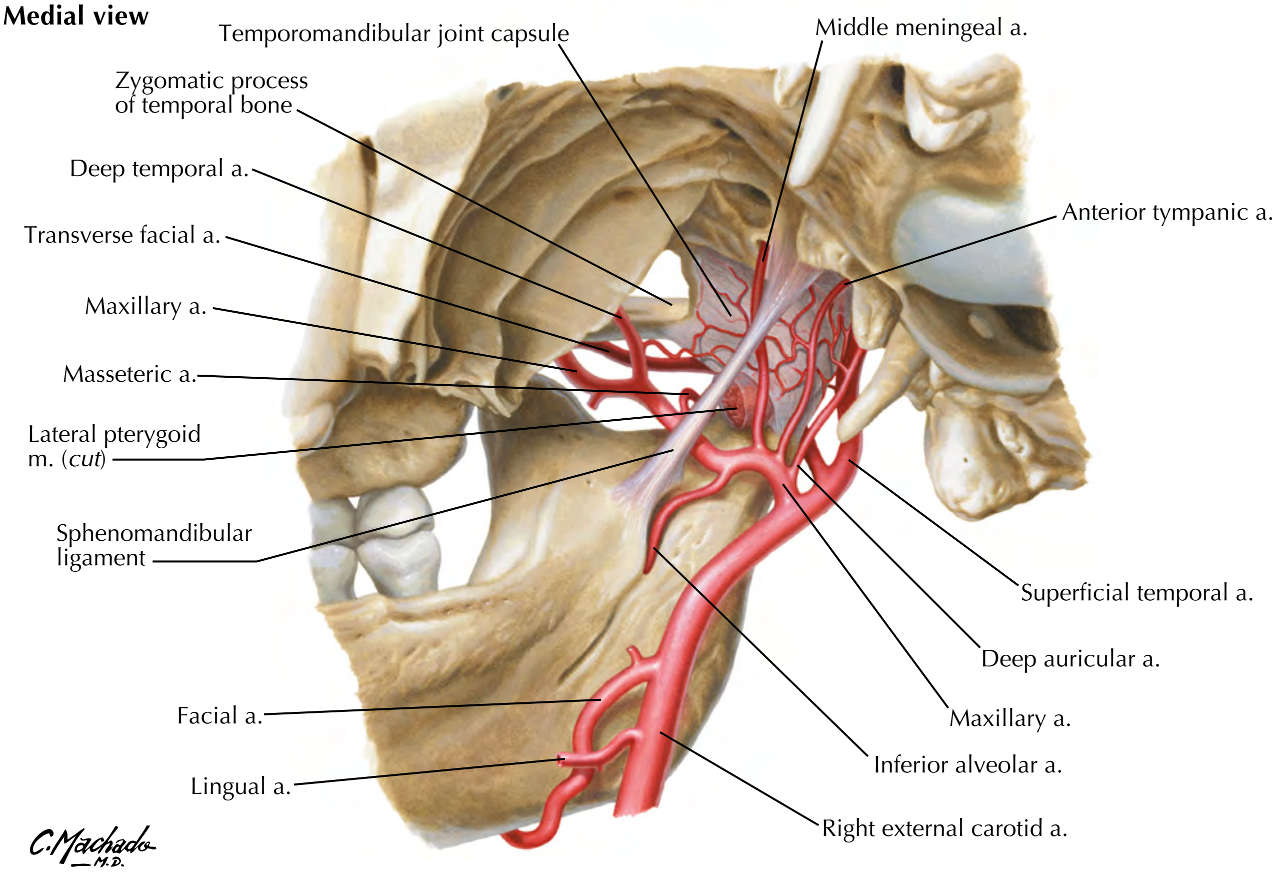
See also **Plates 74, 76, 77**


Masseteric n.
Posterior deep temporal a.
Mandibular n. (CN V_3) (exiting foramen ovale)
Posterior deep temporal n.
Superior head of lateral pterygoid m. (*cut*)
Buccal a.
Anterior deep temporal n.
Temporalis m. (*cut and reflected superiorly*)
Buccal n.
Anterior deep temporal a.
Maxillary n. (CN V_2)
Infraorbital a.
Posterior superior alveolar nn.
Posterior superior alveolar aa.
Inferior head of lateral pterygoid m. (*cut*)
Inferior alveolar a.
Inferior alveolar n.
Lingual n.
Mylohyoid branch of inferior alveolar a.
Nerve to mylohyoid m.
Body of mandible (*cut*)
Medial pterygoid m.
Submandibular ganglion
Window cut through right medial pterygoid m.
Right lingual n.
Right submandibular ganglion
Right facial a.
Right nerve to mylohyoid m.
Right inferior alveolar n.
Superficial temporal a.
Auriculotemporal n.
Condylar process of mandible (*cut*)
Middle meningeal a.
Anterior tympanic a.
Deep auricular a.
Maxillary a.
Posterior auricular n.
Facial n. (CN VII) (*cut*)
Chorda tympani
Internal jugular v. (*cut*)
Spinal accessory n. (CN XI) (*cut*)
Occipital a.
Facial a.
Lingual a.
Hypoglossal n. (CN XII) (*cut*)
Superior root of ansa cervicalis
Inferior root of ansa cervicalis (*cut*)
External carotid a.
Internal carotid a.
Ansa cervicalis
Vagus n. (CN X)
Common carotid a.

Lateral view


Zygomatic process of temporal bone
Temporomandibular joint capsule
Superficial temporal a.
Right external carotid a.
Left external carotid a.
Facial a.
Lingual a.
Deep temporal aa.
Lateral ligament of temporomandibular joint
Transverse facial a.
Maxillary a.
Masseteric a.

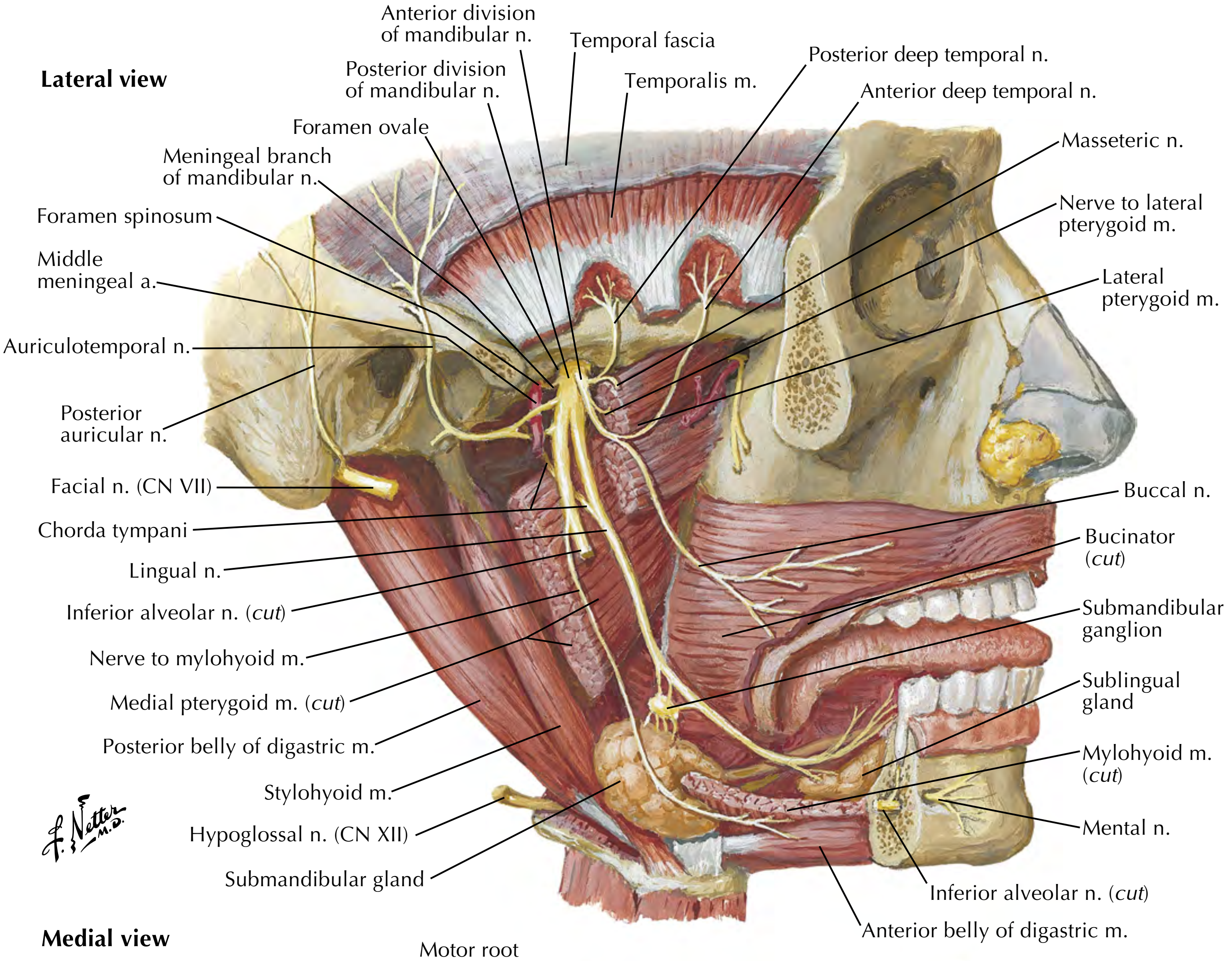
Medial view


Temporomandibular joint capsule
Zygomatic process of temporal bone
Deep temporal a.
Transverse facial a.
Maxillary a.
Masseteric a.
Lateral pterygoid m. (cut)
Sphenomandibular ligament
Facial a.
Lingual a.
Middle meningeal a.
Anterior tympanic a.
Superficial temporal a.
Deep auricular a.
Maxillary a.
Inferior alveolar a.
Right external carotid a.
C.Machado M.D.

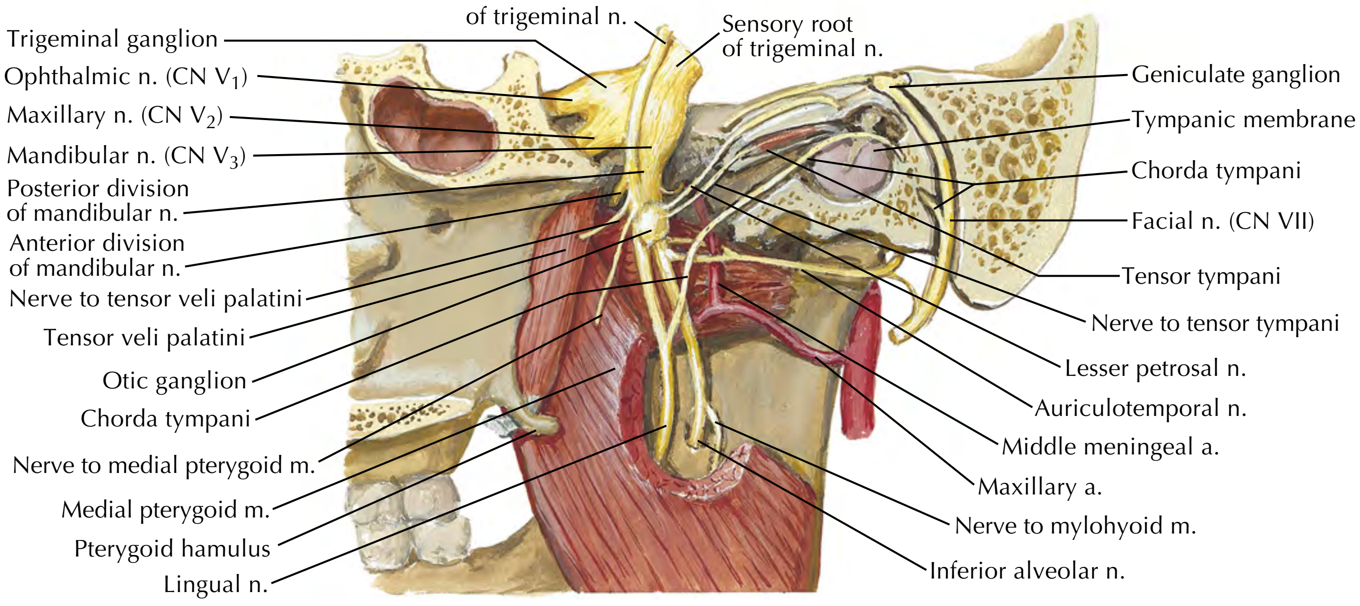
Mandibular Nerve (CN V$_3$)

See also **Plates 98, 149**

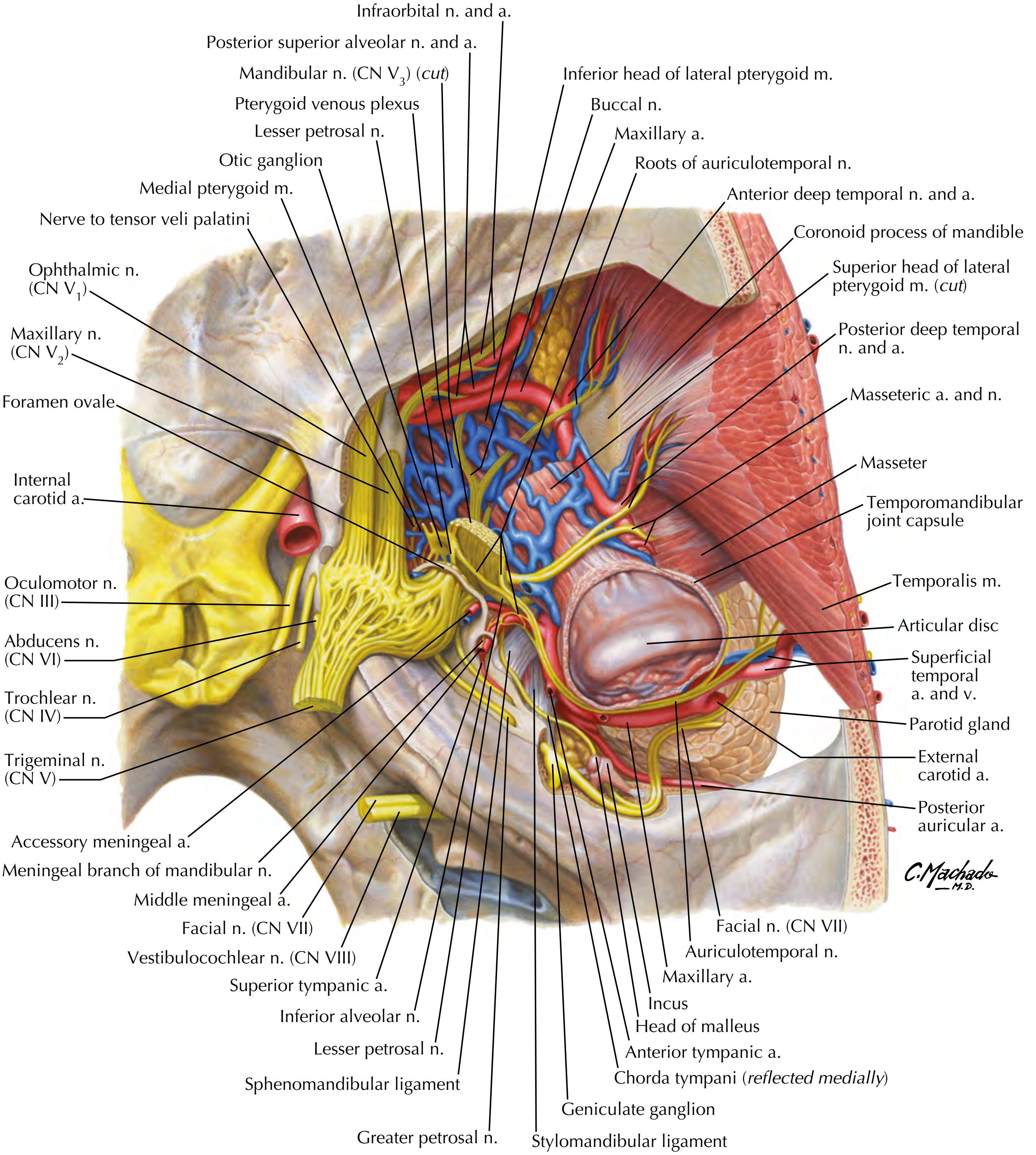
Lateral view


Anterior division of mandibular n.
Posterior division of mandibular n.
Temporal fascia
Temporalis m.
Posterior deep temporal n.
Anterior deep temporal n.
Foramen ovale
Meningeal branch of mandibular n.
Foramen spinosum
Middle meningeal a.
Auriculotemporal n.
Posterior auricular n.
Facial n. (CN VII)
Chorda tympani
Lingual n.
Inferior alveolar n. (cut)
Nerve to mylohyoid m.
Medial pterygoid m. (cut)
Posterior belly of digastric m.
Stylohyoid m.
Hypoglossal n. (CN XII)
Submandibular gland
Masseteric n.
Nerve to lateral pterygoid m.
Lateral pterygoid m.
Buccal n.
Bucinator (cut)
Submandibular ganglion
Sublingual gland
Mylohyoid m. (cut)
Mental n.
Inferior alveolar n. (cut)
Anterior belly of digastric m.

Medial view

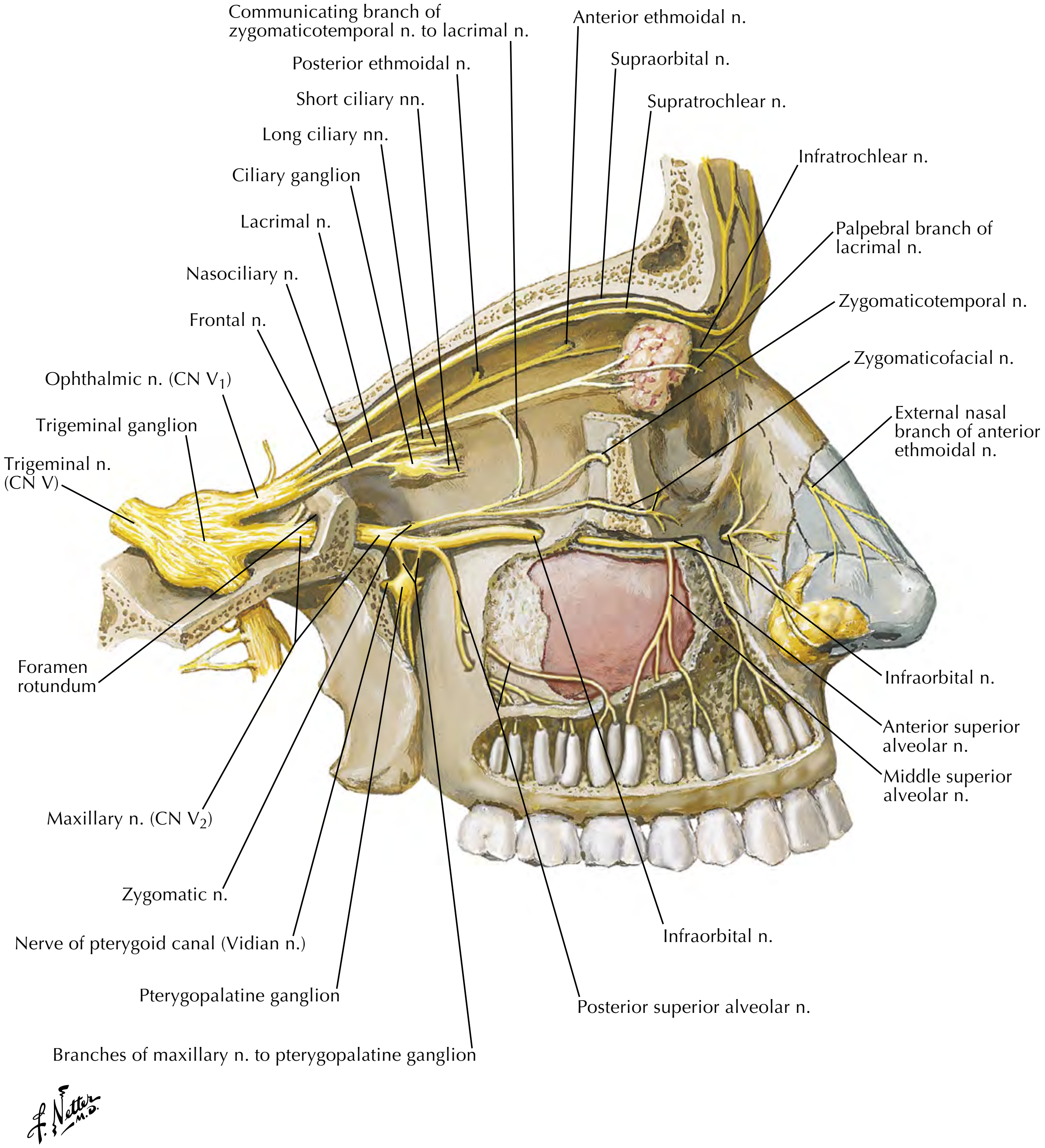

Motor root of trigeminal n.
Sensory root of trigeminal n.
Trigeminal ganglion
Ophthalmic n. (CN V1)
Maxillary n. (CN V2)
Mandibular n. (CN V3)
Posterior division of mandibular n.
Anterior division of mandibular n.
Nerve to tensor veli palatini
Tensor veli palatini
Otic ganglion
Chorda tympani
Nerve to medial pterygoid m.
Medial pterygoid m.
Pterygoid hamulus
Lingual n.
Geniculate ganglion
Tympanic membrane
Chorda tympani
Facial n. (CN VII)
Tensor tympani
Nerve to tensor tympani
Lesser petrosal n.
Auriculotemporal n.
Middle meningeal a.
Maxillary a.
Nerve to mylohyoid m.
Inferior alveolar n.

See also **Plates 74, 76, 77, 81, 82, 131**


Infraorbital n. and a.
Posterior superior alveolar n. and a.
Mandibular n. (CN V3) (cut)
Pterygoid venous plexus
Lesser petrosal n.
Otic ganglion
Medial pterygoid m.
Nerve to tensor veli palatini
Ophthalmic n. (CN V1)
Maxillary n. (CN V2)
Foramen ovale
Internal carotid a.
Oculomotor n. (CN III)
Abducens n. (CN VI)
Trochlear n. (CN IV)
Trigeminal n. (CN V)
Accessory meningeal a.
Meningeal branch of mandibular n.
Middle meningeal a.
Facial n. (CN VII)
Vestibulocochlear n. (CN VIII)
Superior tympanic a.
Inferior alveolar n.
Lesser petrosal n.
Sphenomandibular ligament
Greater petrosal n.
Inferior head of lateral pterygoid m.
Buccal n.
Maxillary a.
Roots of auriculotemporal n.
Anterior deep temporal n. and a.
Coronoid process of mandible
Superior head of lateral pterygoid m. (cut)
Posterior deep temporal n. and a.
Masseteric a. and n.
Masseter
Temporomandibular joint capsule
Temporalis m.
Articular disc
Superficial temporal a. and v.
Parotid gland
External carotid a.
Posterior auricular a.
C.Machado M.D.
Facial n. (CN VII)
Auriculotemporal n.
Maxillary a.
Incus
Head of malleus
Anterior tympanic a.
Chorda tympani (reflected medially)
Geniculate ganglion
Stylomandibular ligament

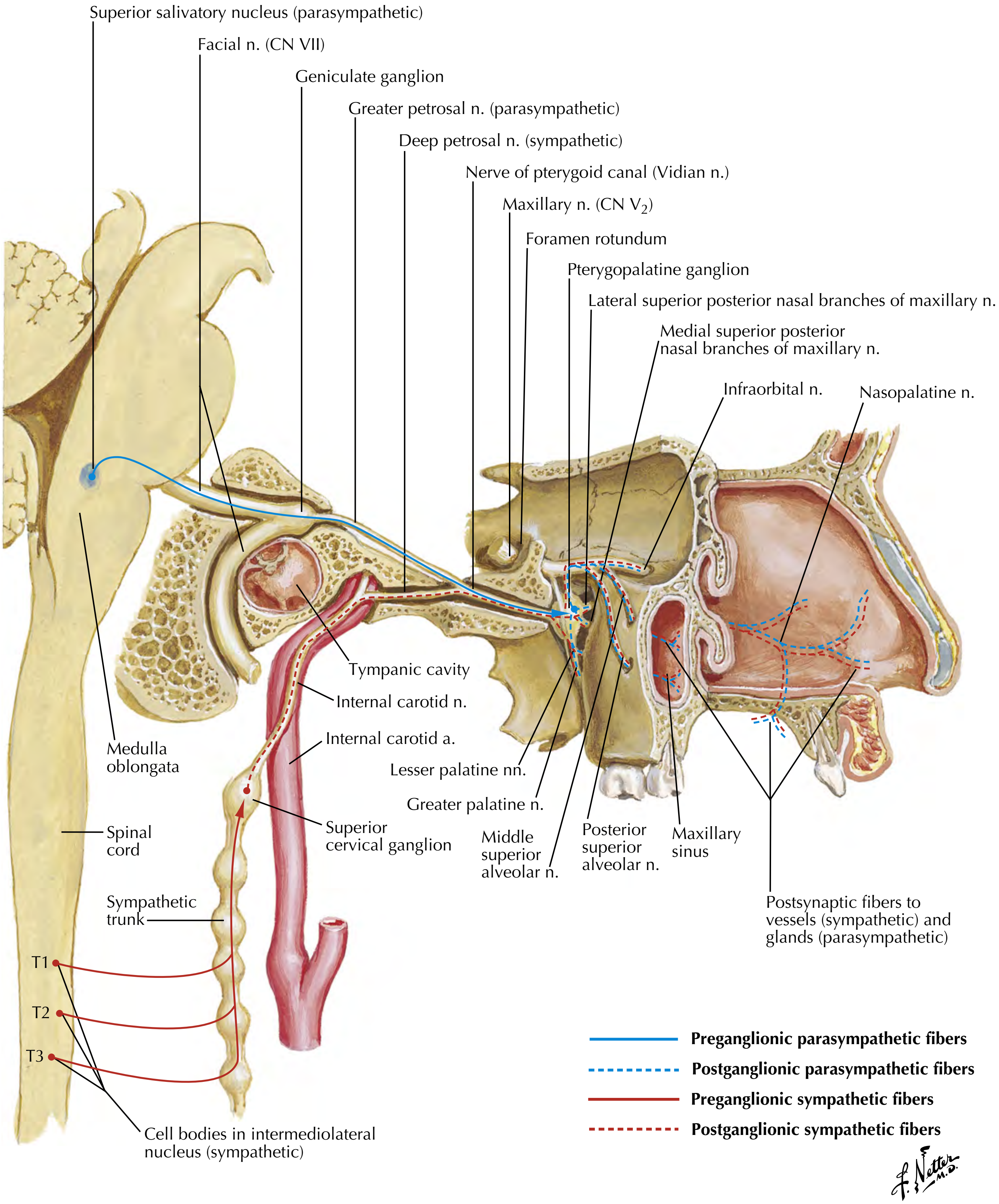
Ophthalmic and Maxillary Nerves

See also **Plates 81, 84**


Communicating branch of zygomaticotemporal n. to lacrimal n.
Anterior ethmoidal n.
Posterior ethmoidal n.
Supraorbital n.
Short ciliary nn.
Supratrochlear n.
Long ciliary nn.
Infratrochlear n.
Ciliary ganglion
Lacrimal n.
Palpebral branch of lacrimal n.
Nasociliary n.
Zygomaticotemporal n.
Frontal n.
Zygomaticofacial n.
Ophthalmic n. (CN V1)
Trigeminal ganglion
External nasal branch of anterior ethmoidal n.
Trigeminal n. (CN V)
Foramen rotundum
Infraorbital n.
Anterior superior alveolar n.
Middle superior alveolar n.
Maxillary n. (CN V2)
Zygomatic n.
Nerve of pterygoid canal (Vidian n.)
Infraorbital n.
Pterygopalatine ganglion
Posterior superior alveolar n.
Branches of maxillary n. to pterygopalatine ganglion
F. Netter M.D.

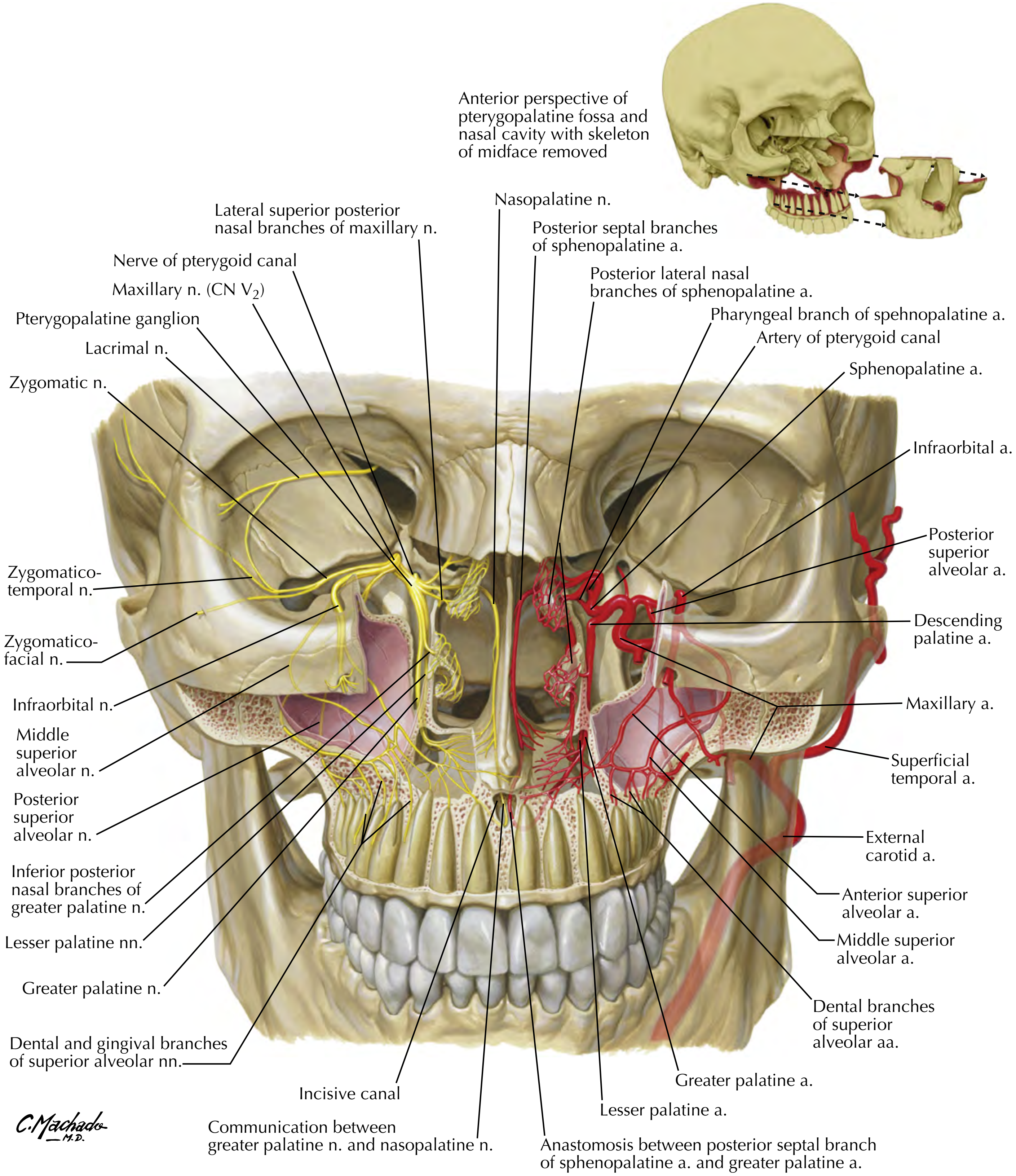
Autonomic Innervation of Nasal Cavity

See also **Plates 149, 158, 160**


Superior salivatory nucleus (parasympathetic)
Facial n. (CN VII)
Geniculate ganglion
Greater petrosal n. (parasympathetic)
Deep petrosal n. (sympathetic)
Nerve of pterygoid canal (Vidian n.)
Maxillary n. (CN V_2)
Foramen rotundum
Pterygopalatine ganglion
Lateral superior posterior nasal branches of maxillary n.
Medial superior posterior nasal branches of maxillary n.
Infraorbital n.
Nasopalatine n.
Tympanic cavity
Internal carotid n.
Internal carotid a.
Lesser palatine nn.
Greater palatine n.
Medulla oblongata
Spinal cord
Superior cervical ganglion
Middle superior alveolar n.
Posterior superior alveolar n.
Maxillary sinus
Postsynaptic fibers to vessels (sympathetic) and glands (parasympathetic)
Sympathetic trunk
T1
T2
T3
Cell bodies in intermediolateral nucleus (sympathetic)
— Preganglionic parasympathetic fibers
- - - Postganglionic parasympathetic fibers
— Preganglionic sympathetic fibers
- - - Postganglionic sympathetic fibers
F. Netter M.D.

Nerves and Arteries of Midface

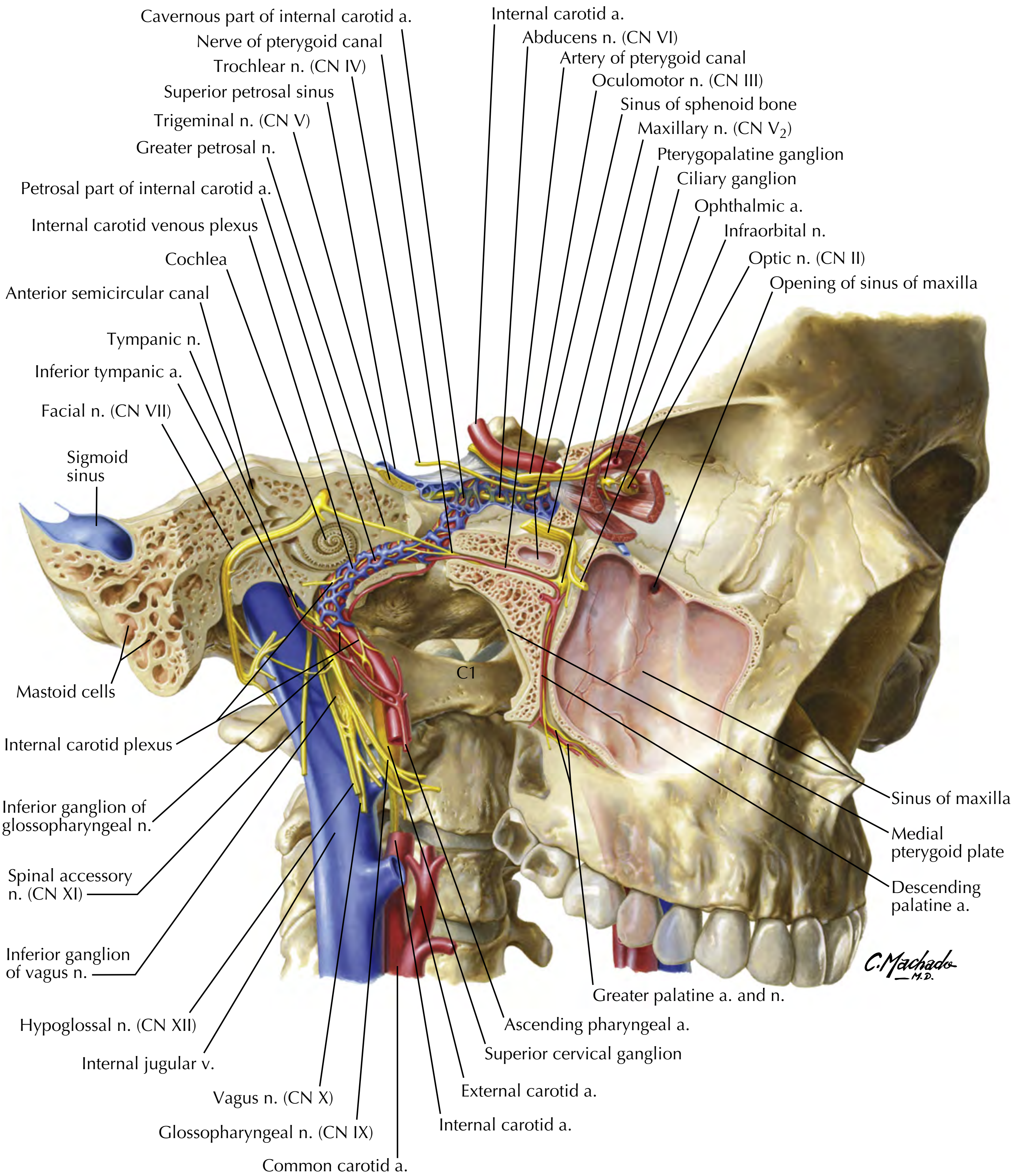
See also **Plates 64, 66, 79**


Anterior perspective of pterygopalatine fossa and nasal cavity with skeleton of midface removed

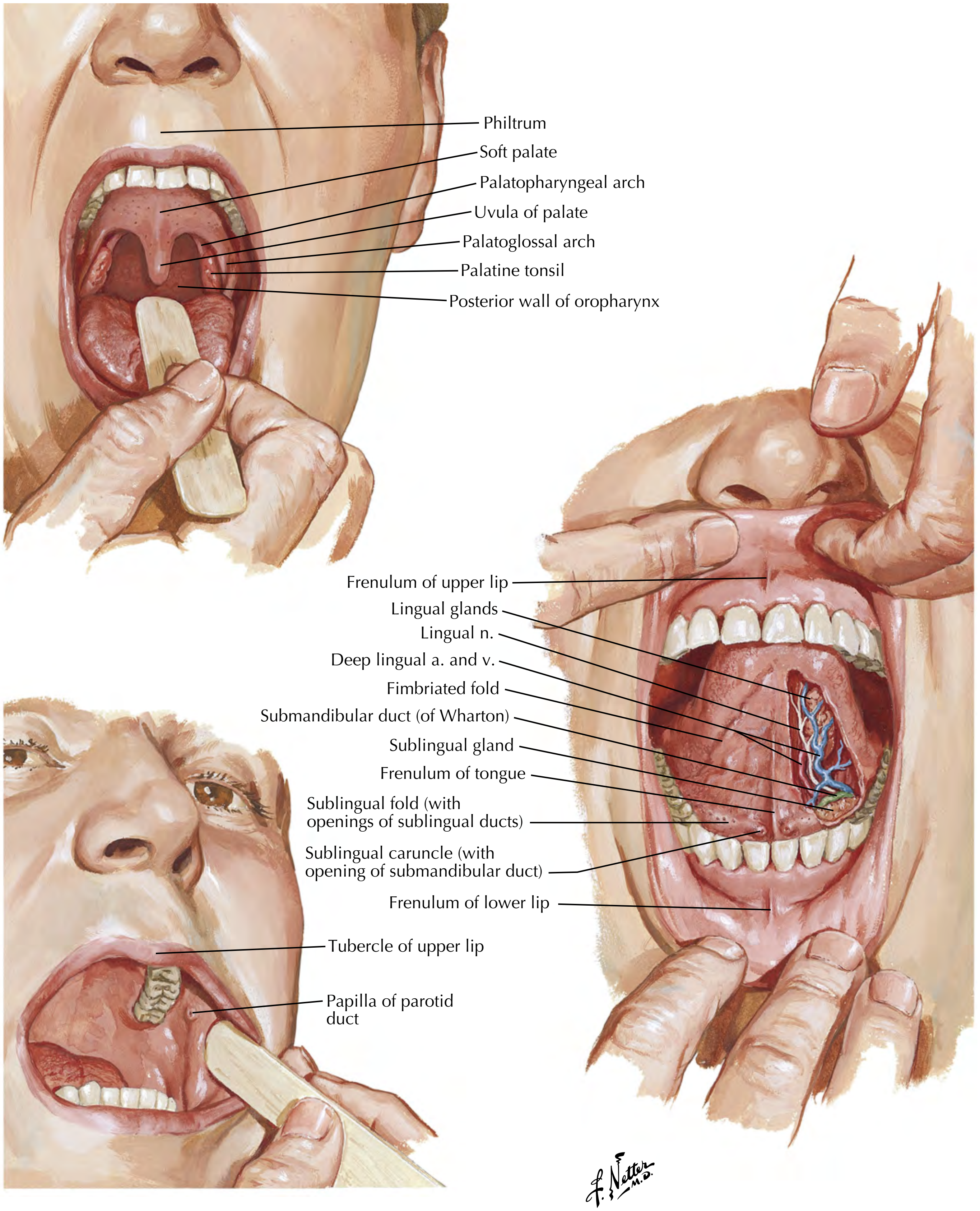
Lateral superior posterior nasal branches of maxillary n.
Nerve of pterygoid canal
Maxillary n. (CN V$_2$)
Pterygopalatine ganglion
Lacrimal n.
Zygomatic n.
Zygomatico-temporal n.
Zygomatico-facial n.
Infraorbital n.
Middle superior alveolar n.
Posterior superior alveolar n.
Inferior posterior nasal branches of greater palatine n.
Lesser palatine nn.
Greater palatine n.
Dental and gingival branches of superior alveolar nn.
Incisive canal
Communication between greater palatine n. and nasopalatine n.
Nasopalatine n.
Posterior septal branches of sphenopalatine a.
Posterior lateral nasal branches of sphenopalatine a.
Pharyngeal branch of spehnopalatine a.
Artery of pterygoid canal
Sphenopalatine a.
Infraorbital a.
Posterior superior alveolar a.
Descending palatine a.
Maxillary a.
Superficial temporal a.
External carotid a.
Anterior superior alveolar a.
Middle superior alveolar a.
Dental branches of superior alveolar aa.
Greater palatine a.
Lesser palatine a.
Anastomosis between posterior septal branch of sphenopalatine a. and greater palatine a.
C. Machado M.D.

Orientation of Nerves and Vessels of Cranial Base

See also **Plates 91, 131, 158, 163**

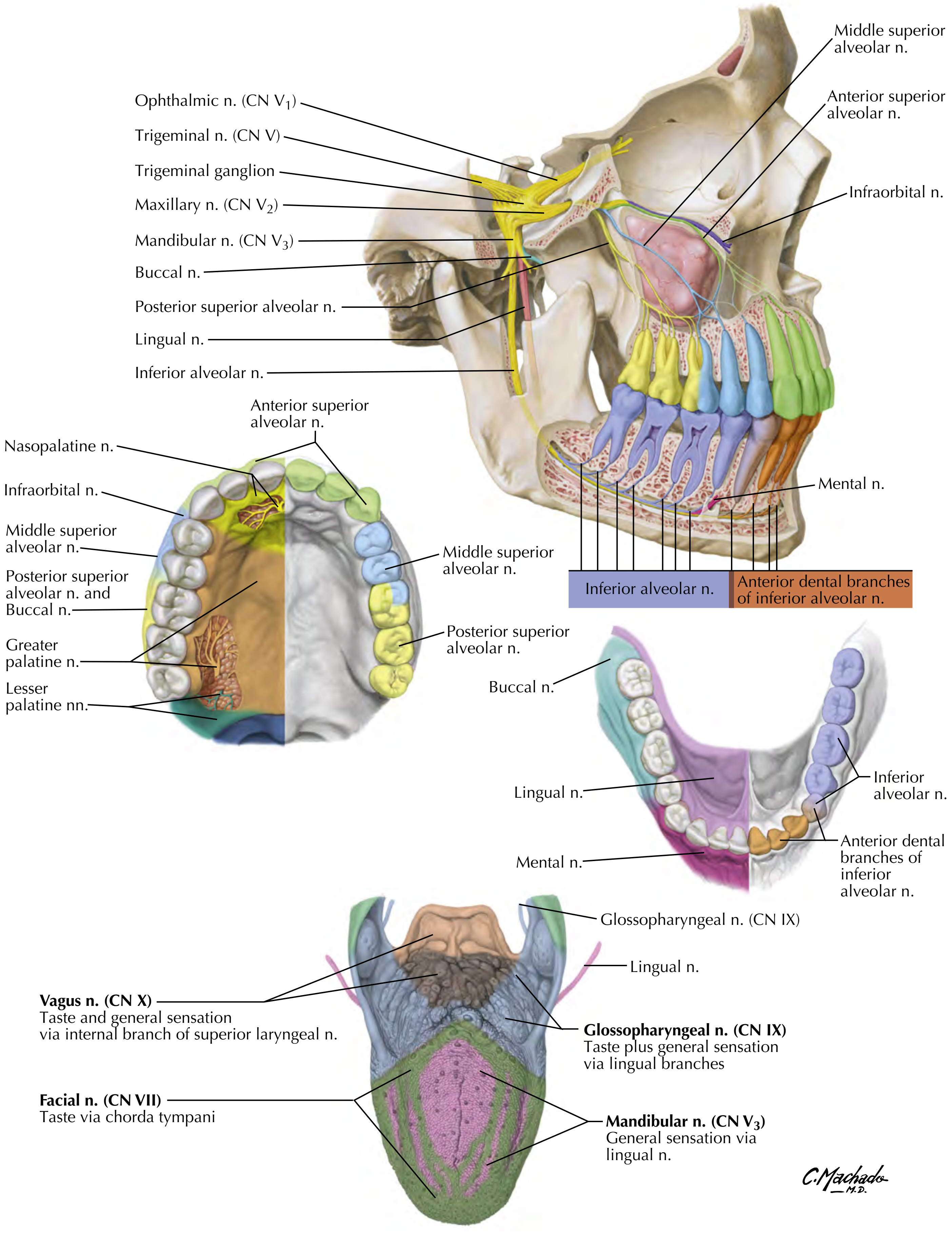

Cavernous part of internal carotid a.
Nerve of pterygoid canal
Trochlear n. (CN IV)
Superior petrosal sinus
Trigeminal n. (CN V)
Greater petrosal n.
Petrosal part of internal carotid a.
Internal carotid venous plexus
Cochlea
Anterior semicircular canal
Tympanic n.
Inferior tympanic a.
Facial n. (CN VII)
Sigmoid sinus
Mastoid cells
Internal carotid plexus
Inferior ganglion of glossopharyngeal n.
Spinal accessory n. (CN XI)
Inferior ganglion of vagus n.
Hypoglossal n. (CN XII)
Internal jugular v.
Vagus n. (CN X)
Glossopharyngeal n. (CN IX)
Common carotid a.
Internal carotid a.
Abducens n. (CN VI)
Artery of pterygoid canal
Oculomotor n. (CN III)
Sinus of sphenoid bone
Maxillary n. (CN V_2)
Pterygopalatine ganglion
Ciliary ganglion
Ophthalmic a.
Infraorbital n.
Optic n. (CN II)
Opening of sinus of maxilla
C1
Sinus of maxilla
Medial pterygoid plate
Descending palatine a.
Greater palatine a. and n.
Ascending pharyngeal a.
Superior cervical ganglion
External carotid a.
Internal carotid a.
C. Machado M.D.

Inspection of Oral Cavity


Philtrum
Soft palate
Palatopharyngeal arch
Uvula of palate
Palatoglossal arch
Palatine tonsil
Posterior wall of oropharynx
Frenulum of upper lip
Lingual glands
Lingual n.
Deep lingual a. and v.
Fimbriated fold
Submandibular duct (of Wharton)
Sublingual gland
Frenulum of tongue
Sublingual fold (with openings of sublingual ducts)
Sublingual caruncle (with opening of submandibular duct)
Frenulum of lower lip
Tubercle of upper lip
Papilla of parotid duct

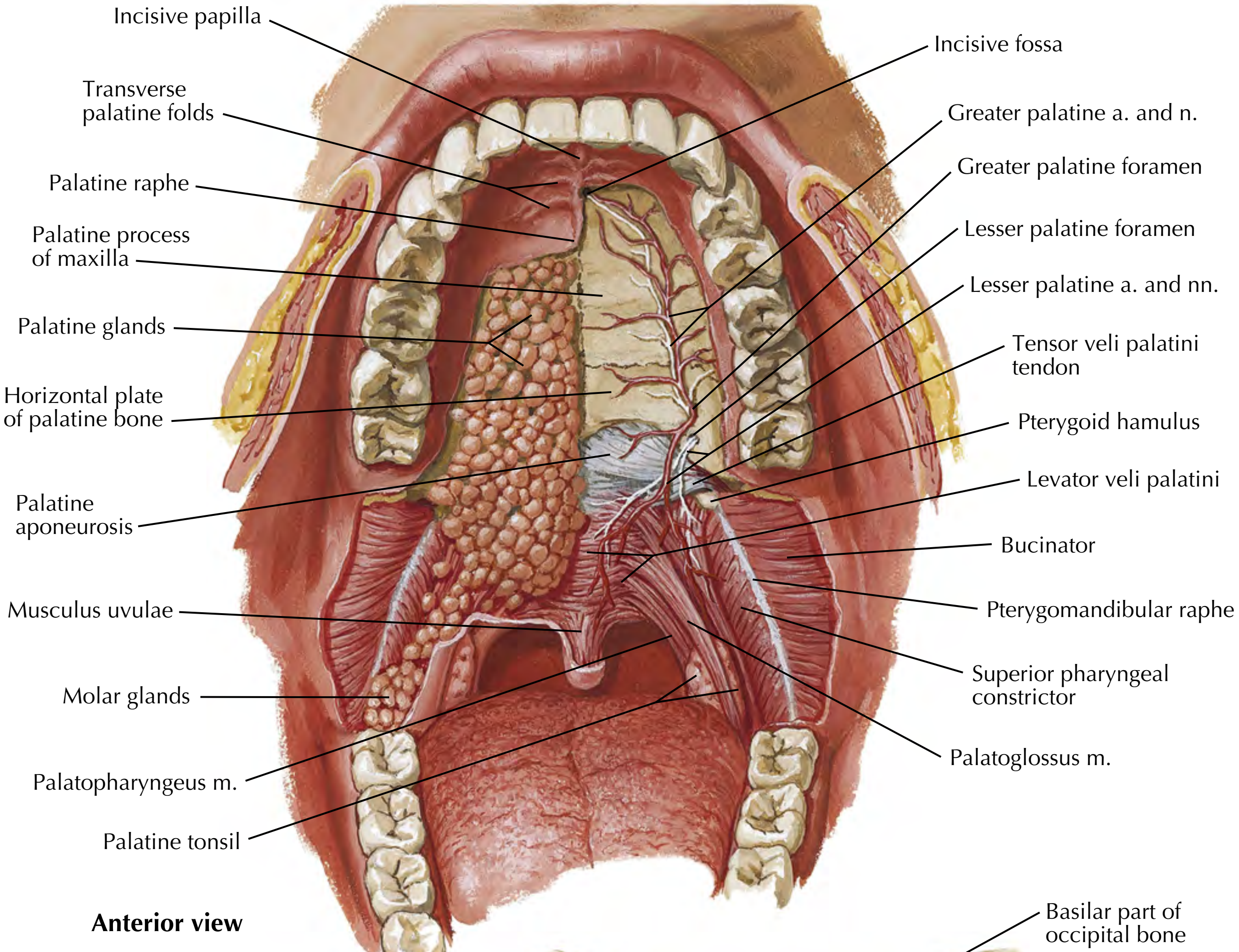
Afferent Innervation of Oral Cavity and Tongue

See also **Plates 77, 79, 160, 162, BP 26**

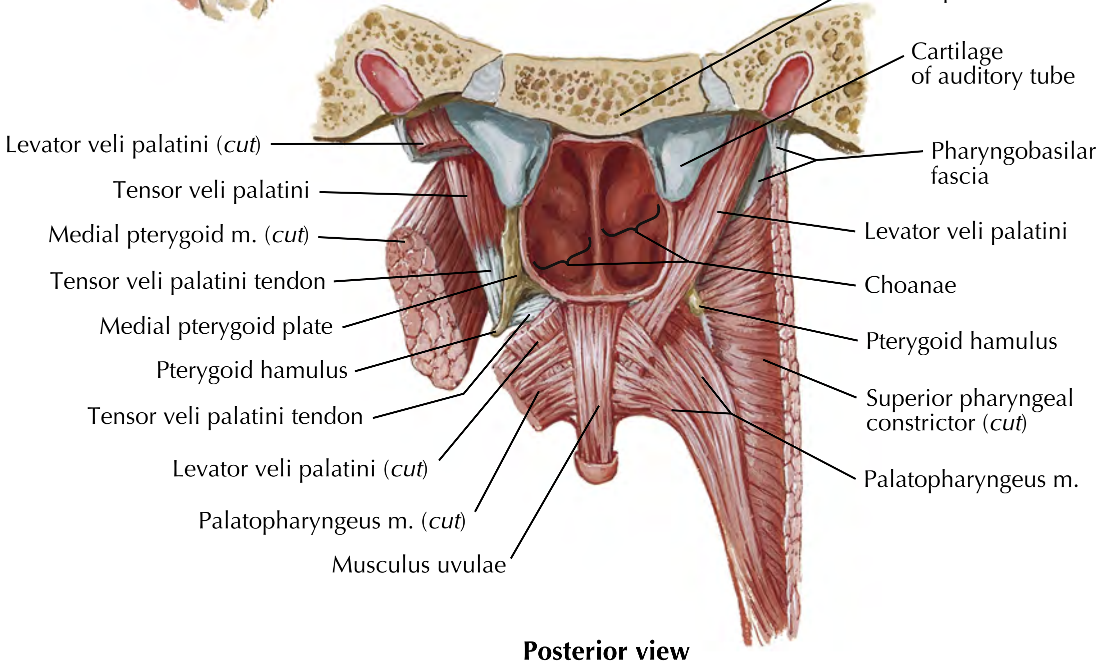

Ophthalmic n. (CN V_1)
Trigeminal n. (CN V)
Trigeminal ganglion
Maxillary n. (CN V_2)
Mandibular n. (CN V_3)
Buccal n.
Posterior superior alveolar n.
Lingual n.
Inferior alveolar n.
Middle superior alveolar n.
Anterior superior alveolar n.
Infraorbital n.
Mental n.
Inferior alveolar n.
Anterior dental branches of inferior alveolar n.
Anterior superior alveolar n.
Nasopalatine n.
Infraorbital n.
Middle superior alveolar n.
Posterior superior alveolar n. and Buccal n.
Greater palatine n.
Lesser palatine nn.
Middle superior alveolar n.
Posterior superior alveolar n.
Buccal n.
Lingual n.
Mental n.
Inferior alveolar n.
Anterior dental branches of inferior alveolar n.
Glossopharyngeal n. (CN IX)
Lingual n.
Vagus n. (CN X)
Taste and general sensation via internal branch of superior laryngeal n.
Glossopharyngeal n. (CN IX)
Taste plus general sensation via lingual branches
Facial n. (CN VII)
Taste via chorda tympani
Mandibular n. (CN V_3)
General sensation via lingual n.
C.Machado M.D.

Roof of Oral Cavity

See also **Plates 66, 79, BP 26**

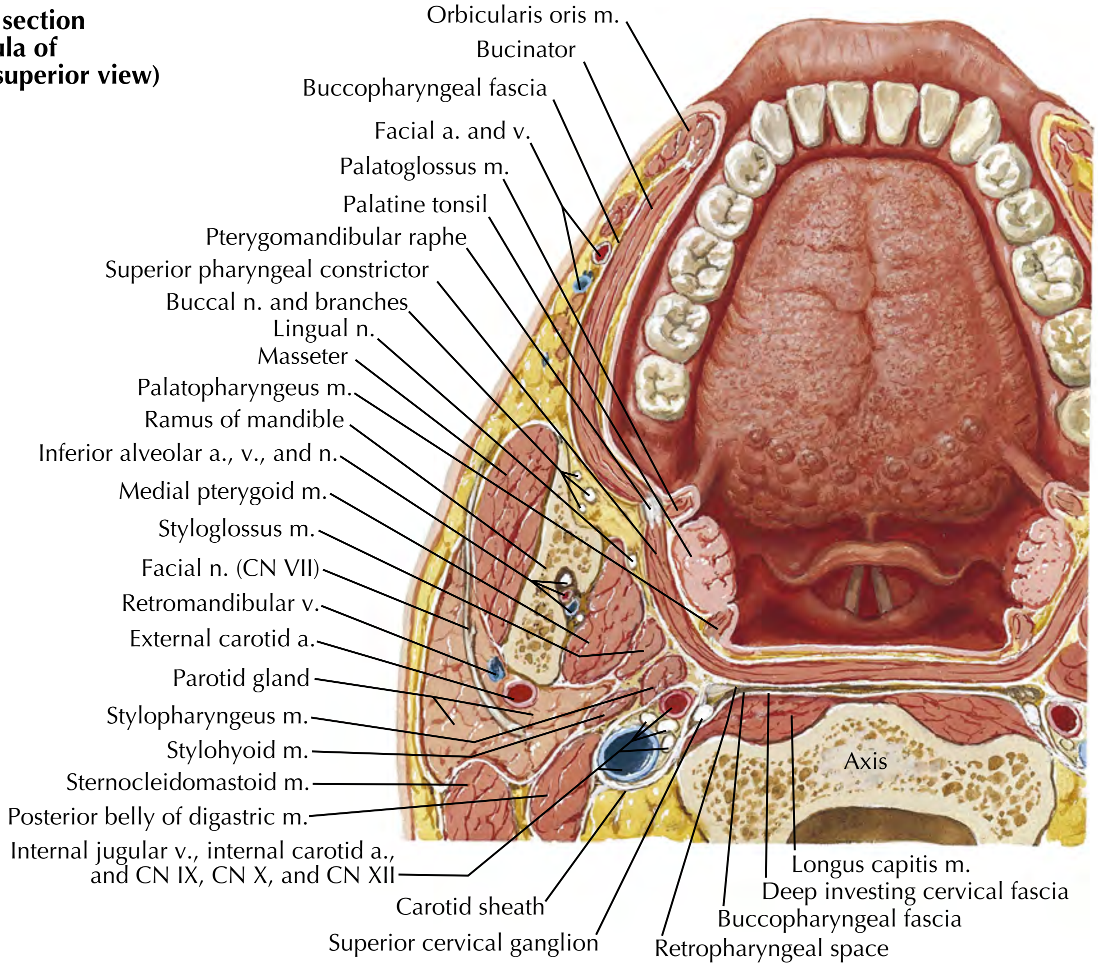

Incisive papilla
Transverse palatine folds
Palatine raphe
Palatine process of maxilla
Palatine glands
Horizontal plate of palatine bone
Palatine aponeurosis
Musculus uvulae
Molar glands
Palatopharyngeus m.
Palatine tonsil
Incisive fossa
Greater palatine a. and n.
Greater palatine foramen
Lesser palatine foramen
Lesser palatine a. and nn.
Tensor veli palatini tendon
Pterygoid hamulus
Levator veli palatini
Bucinator
Pterygomandibular raphe
Superior pharyngeal constrictor
Palatoglossus m.

Anterior view


Basilar part of occipital bone
Cartilage of auditory tube
Pharyngobasilar fascia
Levator veli palatini
Choanae
Pterygoid hamulus
Superior pharyngeal constrictor (*cut*)
Palatopharyngeus m.
Levator veli palatini (*cut*)
Tensor veli palatini
Medial pterygoid m. (*cut*)
Tensor veli palatini tendon
Medial pterygoid plate
Pterygoid hamulus
Tensor veli palatini tendon
Levator veli palatini (*cut*)
Palatopharyngeus m. (*cut*)
Musculus uvulae

Posterior view

Horizontal section below lingula of mandible (superior view)


Orbicularis oris m.
Bucinator
Buccopharyngeal fascia
Facial a. and v.
Palatoglossus m.
Palatine tonsil
Pterygomandibular raphe
Superior pharyngeal constrictor
Buccal n. and branches
Lingual n.
Masseter
Palatopharyngeus m.
Ramus of mandible
Inferior alveolar a., v., and n.
Medial pterygoid m.
Styloglossus m.
Facial n. (CN VII)
Retromandibular v.
External carotid a.
Parotid gland
Stylopharyngeus m.
Stylohyoid m.
Sternocleidomastoid m.
Posterior belly of digastric m.
Internal jugular v., internal carotid a., and CN IX, CN X, and CN XII
Carotid sheath
Superior cervical ganglion
Axis
Longus capitis m.
Deep investing cervical fascia
Buccopharyngeal fascia
Retropharyngeal space

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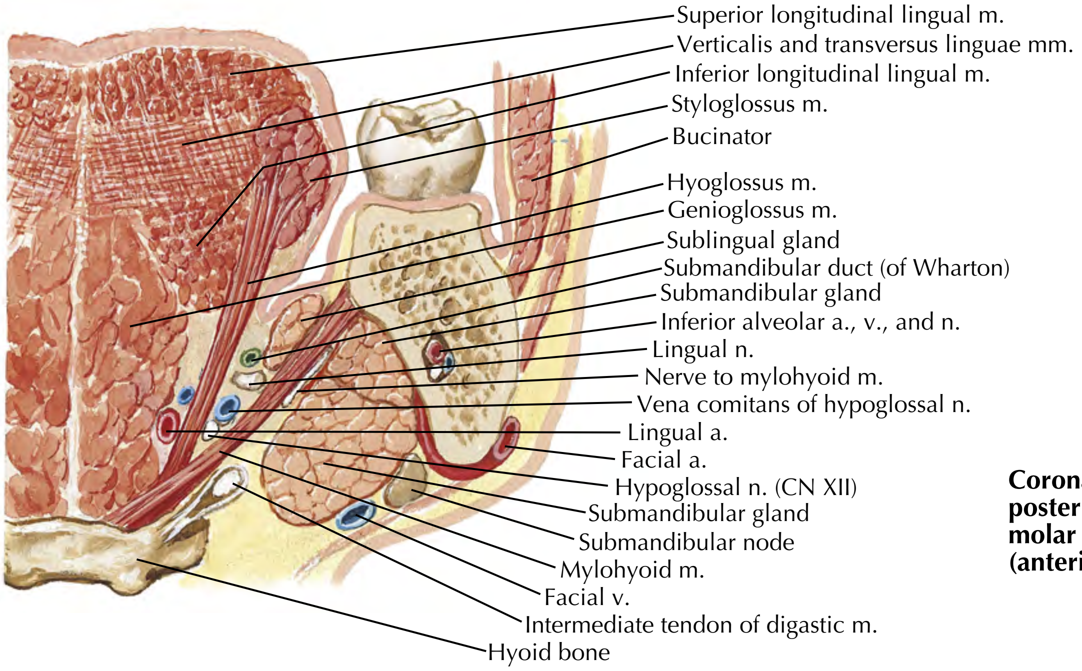
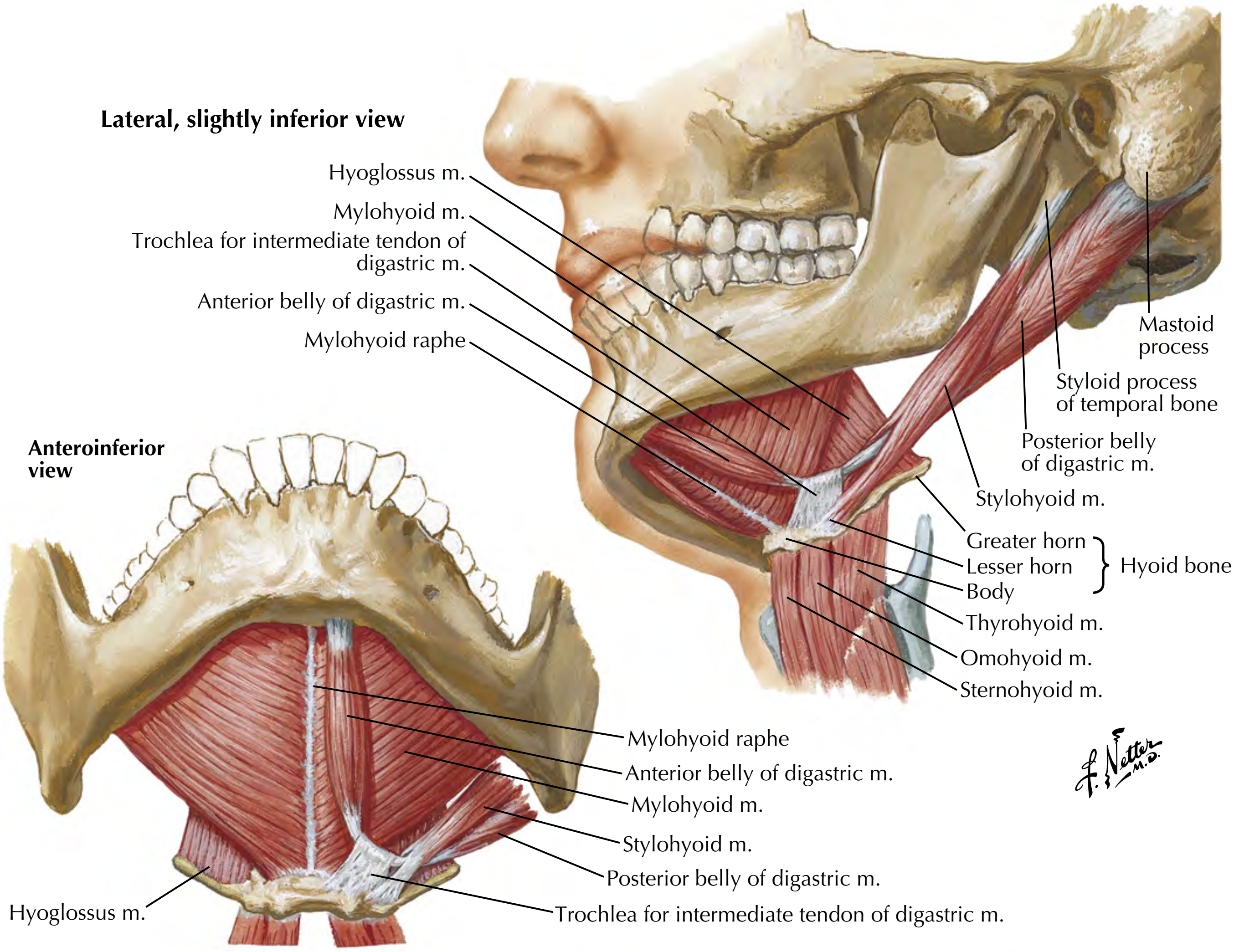

Superior longitudinal lingual m.
Verticalis and transversus linguae mm.
Inferior longitudinal lingual m.
Styloglossus m.
Bucinator
Hyoglossus m.
Genioglossus m.
Sublingual gland
Submandibular duct (of Wharton)
Submandibular gland
Inferior alveolar a., v., and n.
Lingual n.
Nerve to mylohyoid m.
Vena comitans of hypoglossal n.
Lingual a.
Facial a.
Hypoglossal n. (CN XII)
Submandibular gland
Submandibular node
Mylohyoid m.
Facial v.
Intermediate tendon of digastric m.
Hyoid bone

Coronal section posterior to 1st molar tooth (anterior view)

Suprahyoid Muscles

See also **Plates 53, 77**

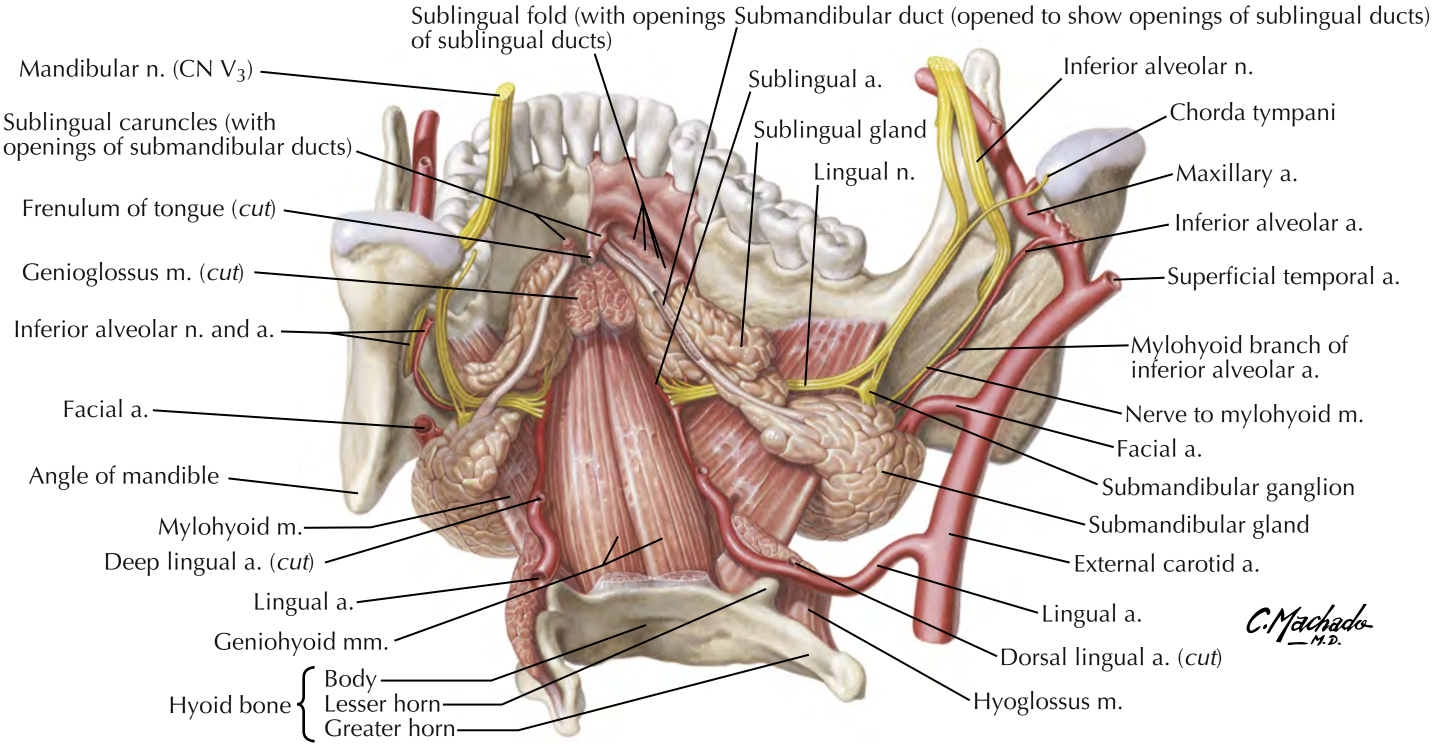


Lateral, slightly inferior view

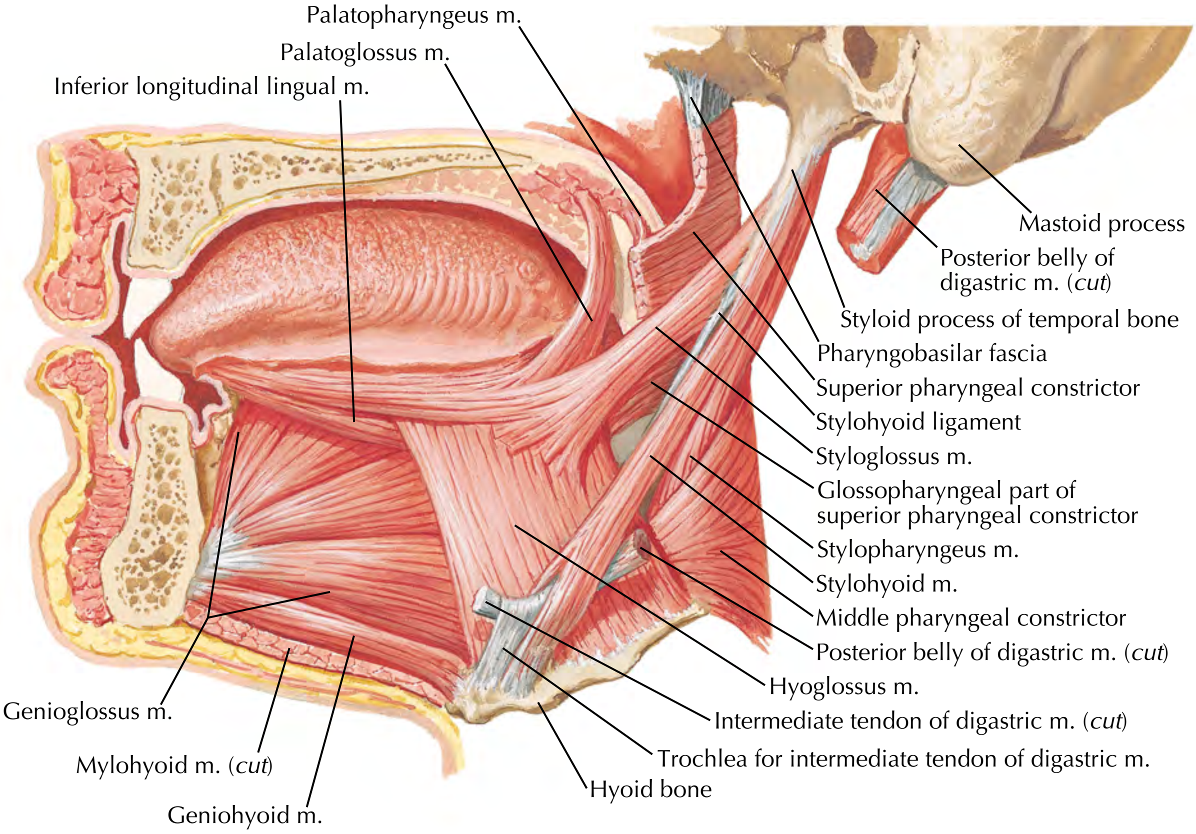
Hyoglossus m.
Mylohyoid m.
Trochlea for intermediate tendon of digastric m.
Anterior belly of digastric m.
Mylohyoid raphe
Mastoid process
Styloid process of temporal bone
Posterior belly of digastric m.
Stylohyoid m.
Greater horn
Lesser horn
Body
Hyoid bone
Thyrohyoid m.
Omohyoid m.
Sternohyoid m.

Anteroinferior view

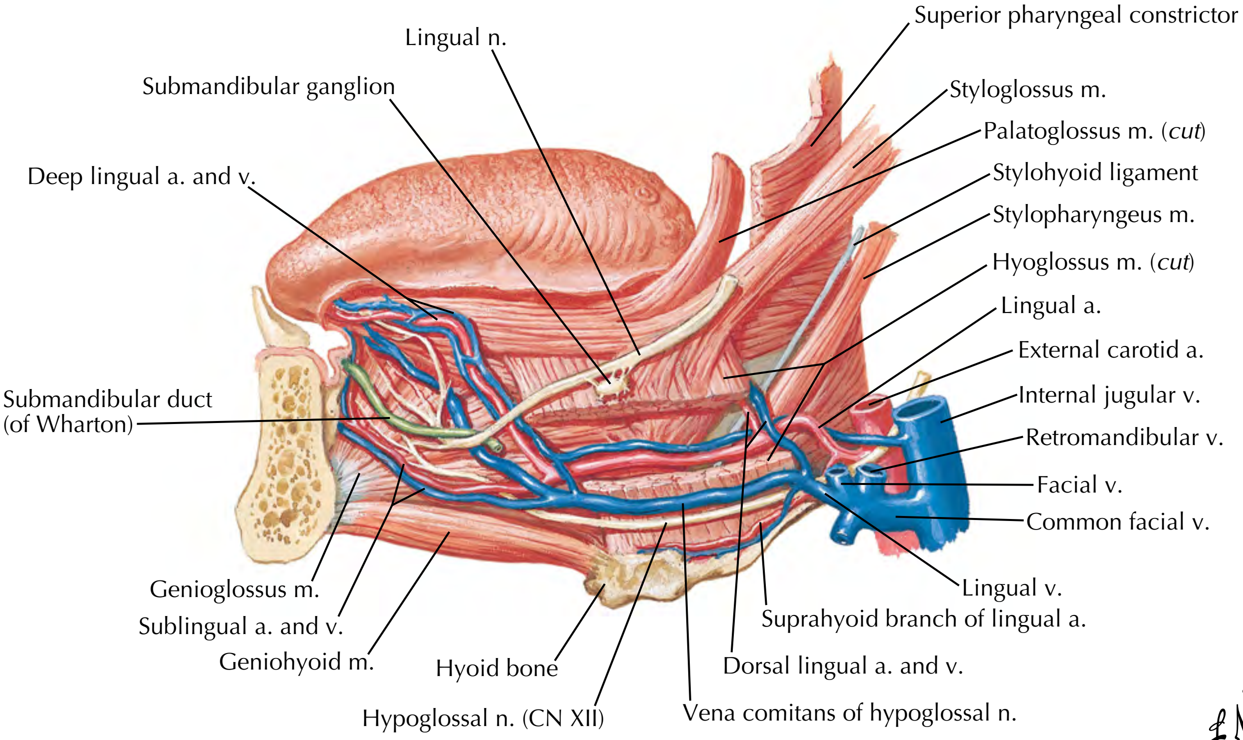
Mylohyoid raphe
Anterior belly of digastric m.
Mylohyoid m.
Stylohyoid m.
Posterior belly of digastric m.
Trochlea for intermediate tendon of digastric m.
Hyoglossus m.
F. Netter M.D.



Sublingual fold (with openings of sublingual ducts)
Submandibular duct (opened to show openings of sublingual ducts)
Mandibular n. (CN V3)
Sublingual a.
Inferior alveolar n.
Sublingual caruncles (with openings of submandibular ducts)
Sublingual gland
Chorda tympani
Lingual n.
Maxillary a.
Frenulum of tongue (cut)
Inferior alveolar a.
Genioglossus m. (cut)
Superficial temporal a.
Inferior alveolar n. and a.
Mylohyoid branch of inferior alveolar a.
Facial a.
Nerve to mylohyoid m.
Facial a.
Angle of mandible
Submandibular ganglion
Submandibular gland
Mylohyoid m.
Deep lingual a. (cut)
External carotid a.
Lingual a.
Lingual a.
Geniohyoid mm.
Dorsal lingual a. (cut)
Hyoid bone
Body
Lesser horn
Greater horn
Hyoglossus m.
C. Machado M.D.


Palatopharyngeus m.
Palatoglossus m.
Inferior longitudinal lingual m.
Mastoid process
Posterior belly of digastric m. (*cut*)
Styloid process of temporal bone
Pharyngobasilar fascia
Superior pharyngeal constrictor
Stylohyoid ligament
Styloglossus m.
Glossopharyngeal part of superior pharyngeal constrictor
Stylopharyngeus m.
Stylohyoid m.
Middle pharyngeal constrictor
Posterior belly of digastric m. (*cut*)
Hyoglossus m.
Intermediate tendon of digastric m. (*cut*)
Trochlea for intermediate tendon of digastric m.
Hyoid bone
Genioglossus m.
Mylohyoid m. (*cut*)
Geniohyoid m.

Lateral view (left side of mandible removed)


Lingual n.
Submandibular ganglion
Deep lingual a. and v.
Submandibular duct (of Wharton)
Superior pharyngeal constrictor
Styloglossus m.
Palatoglossus m. (*cut*)
Stylohyoid ligament
Stylopharyngeus m.
Hyoglossus m. (*cut*)
Lingual a.
External carotid a.
Internal jugular v.
Retromandibular v.
Facial v.
Common facial v.
Lingual v.
Suprahyoid branch of lingual a.
Dorsal lingual a. and v.
Vena comitans of hypoglossal n.
Genioglossus m.
Sublingual a. and v.
Geniohyoid m.
Hyoid bone
Hypoglossal n. (CN XII)

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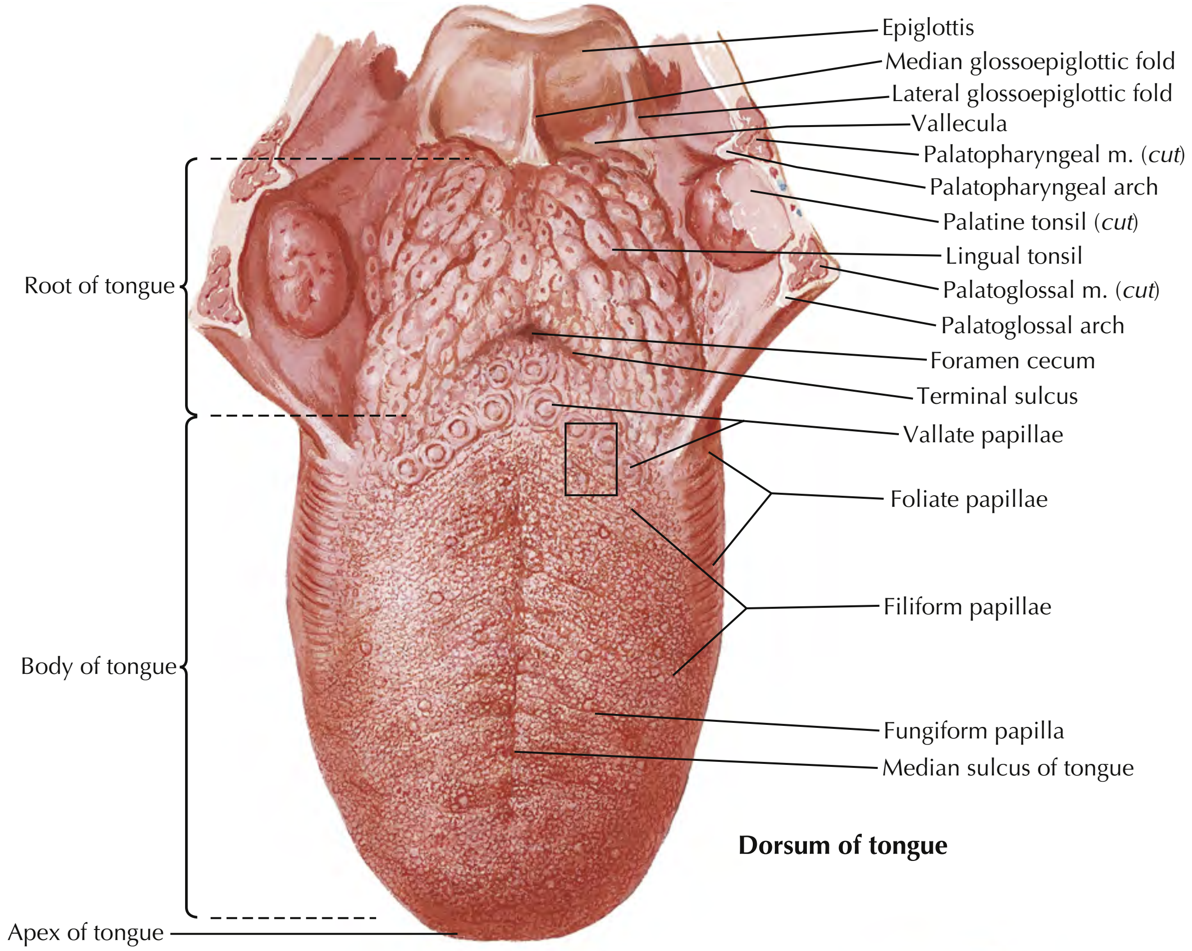
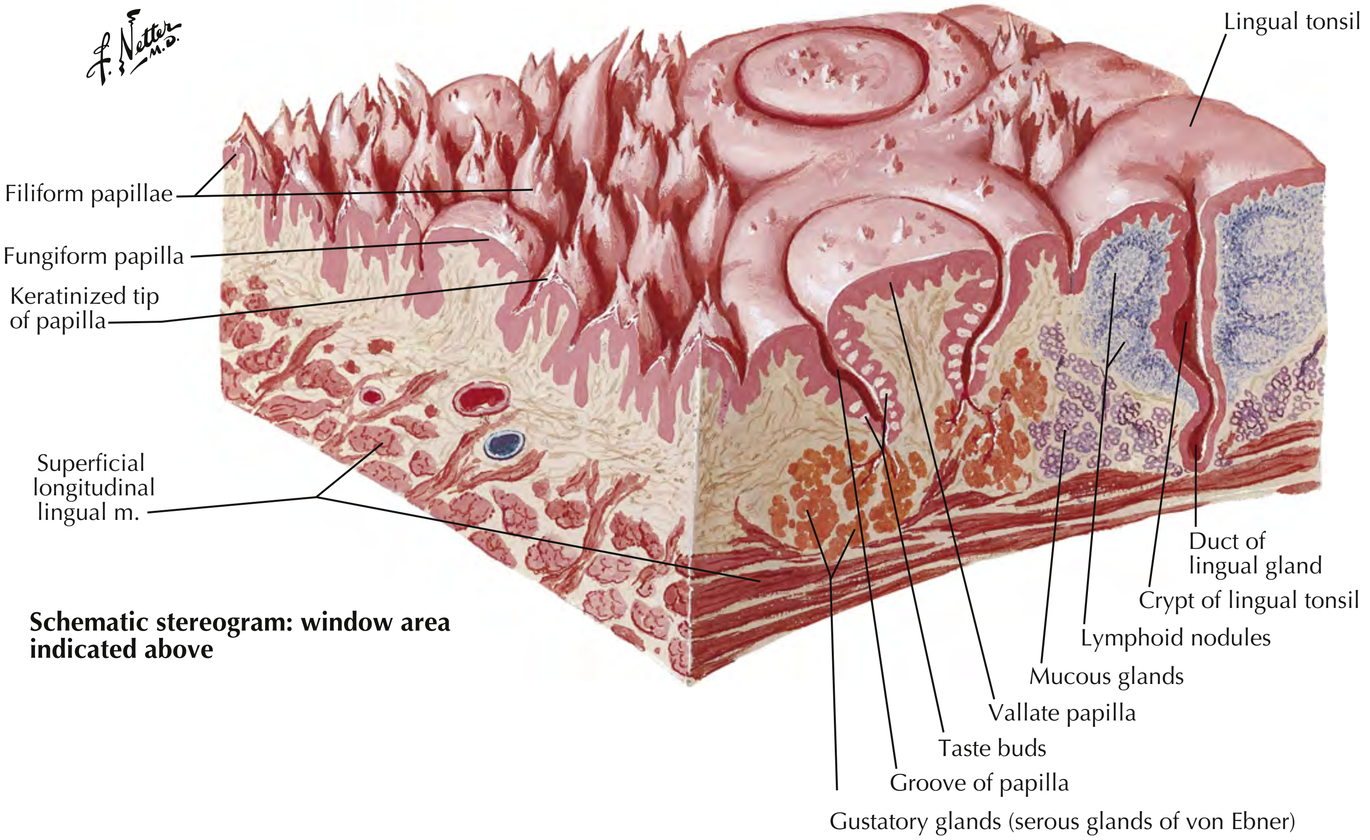
Dorsum of Tongue


Epiglottis
Median glossoepiglottic fold
Lateral glossoepiglottic fold
Vallecula
Palatopharyngeal m. (*cut*)
Palatopharyngeal arch
Palatine tonsil (*cut*)
Lingual tonsil
Palatoglossal m. (*cut*)
Palatoglossal arch
Foramen cecum
Terminal sulcus
Vallate papillae
Foliate papillae
Filiform papillae
Fungiform papilla
Median sulcus of tongue
Root of tongue
Body of tongue
Apex of tongue

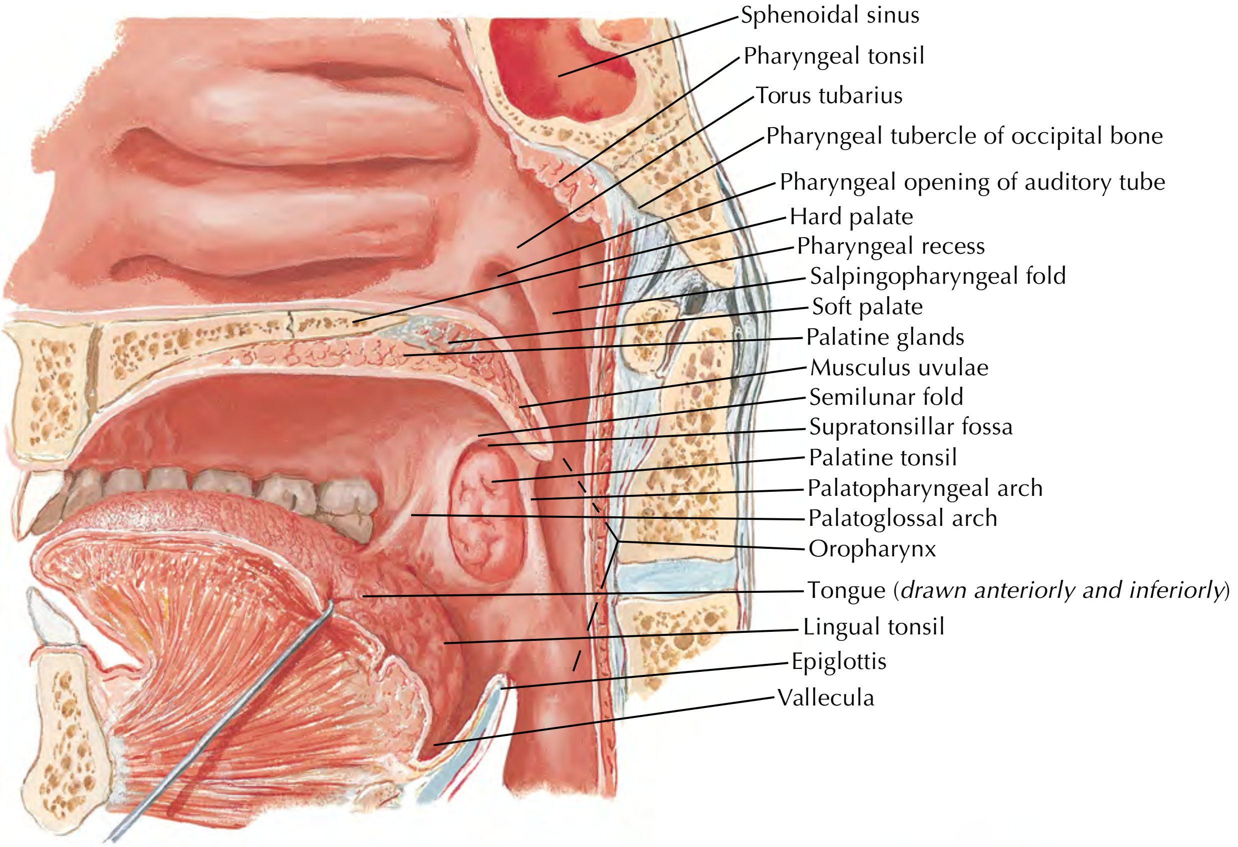
Dorsum of tongue


Lingual tonsil
Filiform papillae
Fungiform papilla
Keratinized tip of papilla
Superficial longitudinal lingual m.
Duct of lingual gland
Crypt of lingual tonsil
Lymphoid nodules
Mucous glands
Vallate papilla
Taste buds
Groove of papilla
Gustatory glands (serous glands of von Ebner)

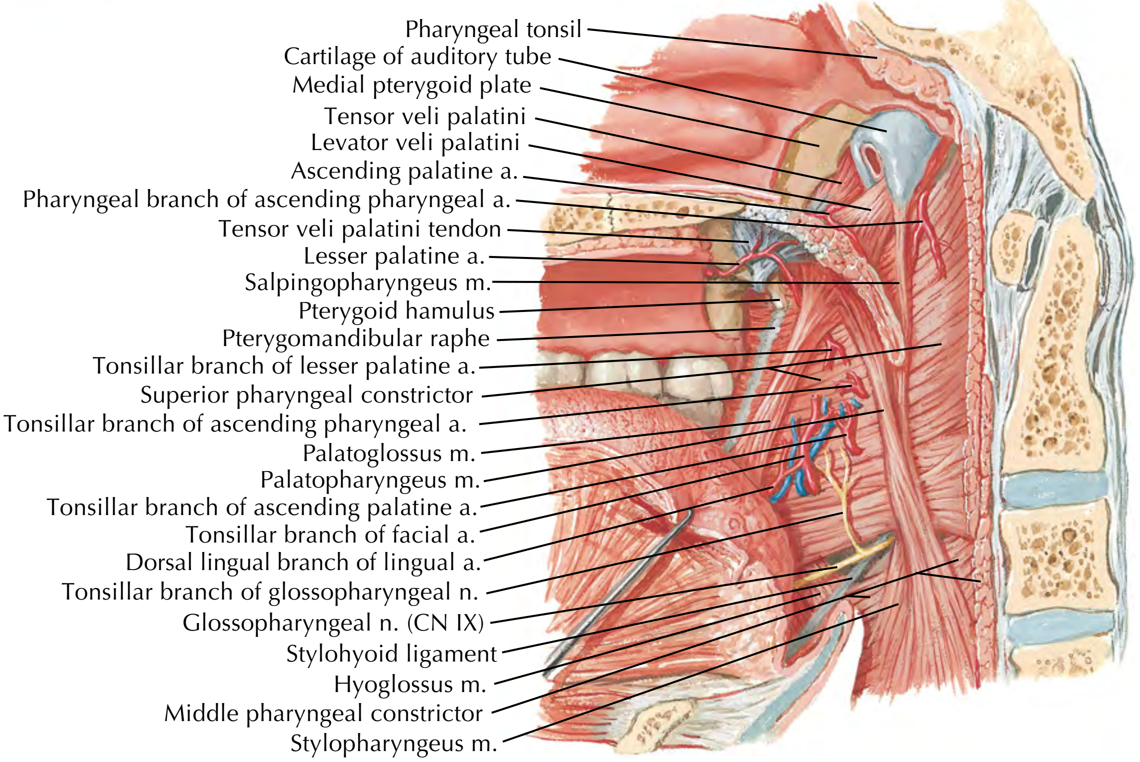
Schematic stereogram: window area indicated above

See also **Plate 76**

Medial view sagittal section


Sphenoidal sinus
Pharyngeal tonsil
Torus tubarius
Pharyngeal tubercle of occipital bone
Pharyngeal opening of auditory tube
Hard palate
Pharyngeal recess
Salpingopharyngeal fold
Soft palate
Palatine glands
Musculus uvulae
Semilunar fold
Supratonsillar fossa
Palatine tonsil
Palatopharyngeal arch
Palatoglossal arch
Oropharynx
Tongue (*drawn anteriorly and inferiorly*)
Lingual tonsil
Epiglottis
Vallecula

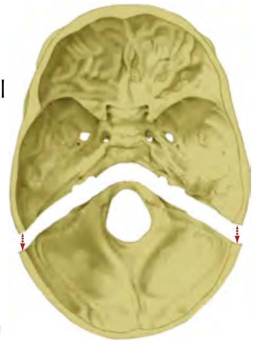
Pharyngeal mucosa removed


Pharyngeal tonsil
Cartilage of auditory tube
Medial pterygoid plate
Tensor veli palatini
Levator veli palatini
Ascending palatine a.
Pharyngeal branch of ascending pharyngeal a.
Tensor veli palatini tendon
Lesser palatine a.
Salpingopharyngeus m.
Pterygoid hamulus
Pterygomandibular raphe
Tonsillar branch of lesser palatine a.
Superior pharyngeal constrictor
Tonsillar branch of ascending pharyngeal a.
Palatoglossus m.
Palatopharyngeus m.
Tonsillar branch of ascending palatine a.
Tonsillar branch of facial a.
Dorsal lingual branch of lingual a.
Tonsillar branch of glossopharyngeal n.
Glossopharyngeal n. (CN IX)
Stylohyoid ligament
Hyoglossus m.
Middle pharyngeal constrictor
Stylopharyngeus m.

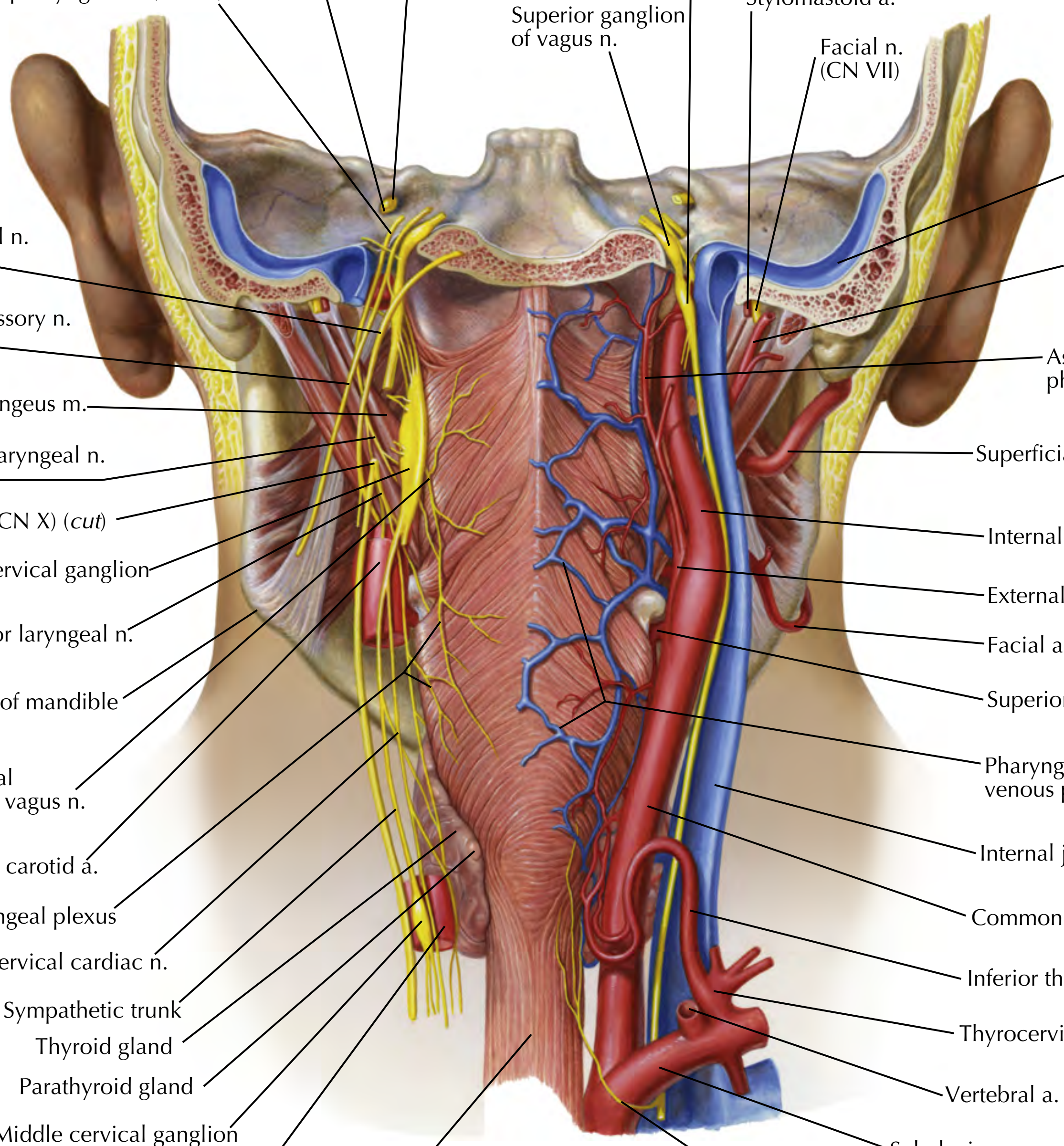
F. Netter M.D.

Posterior View of Pharynx: Nerves and Vessels

See also **Plates 92, 93, 98, 99**

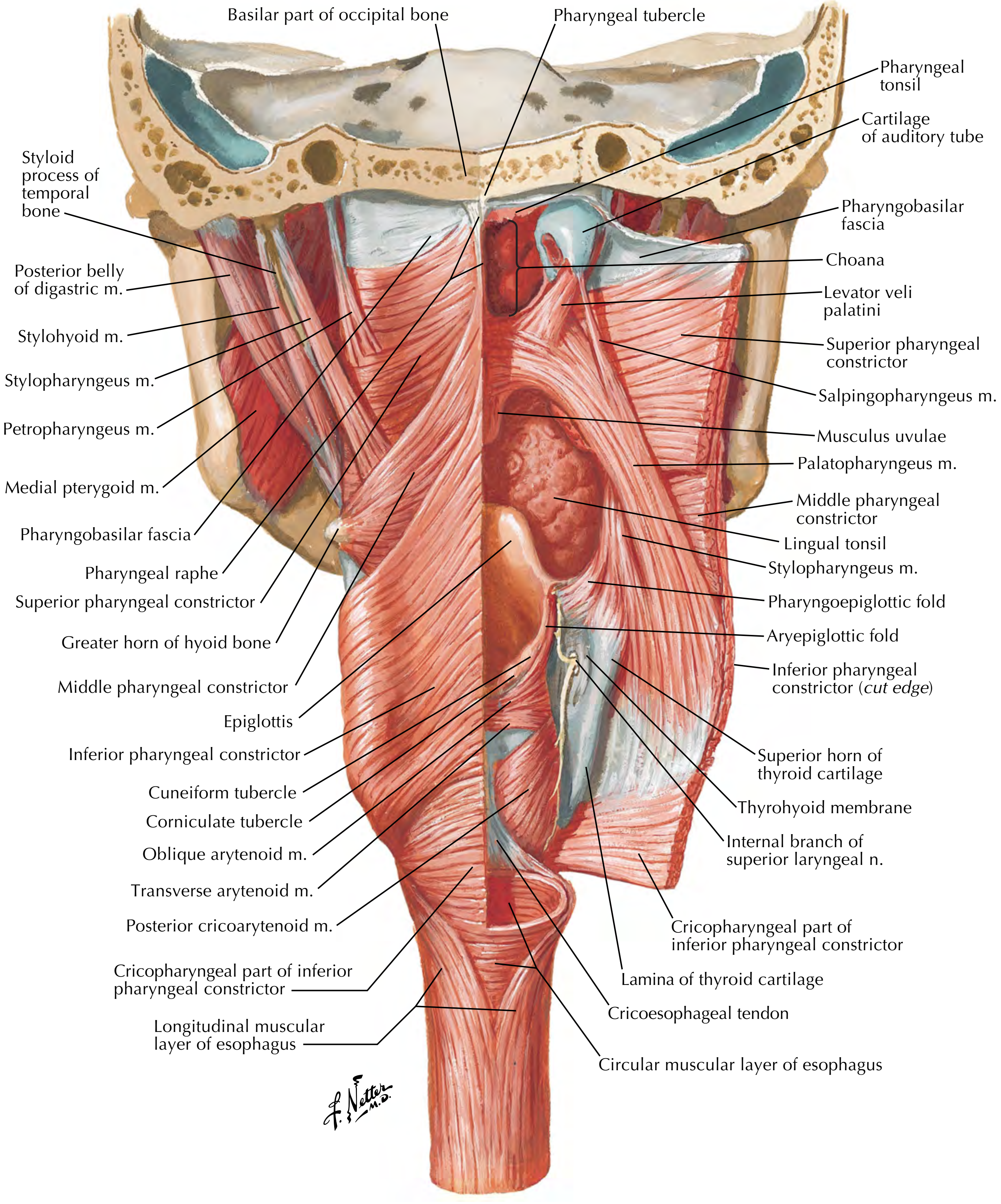


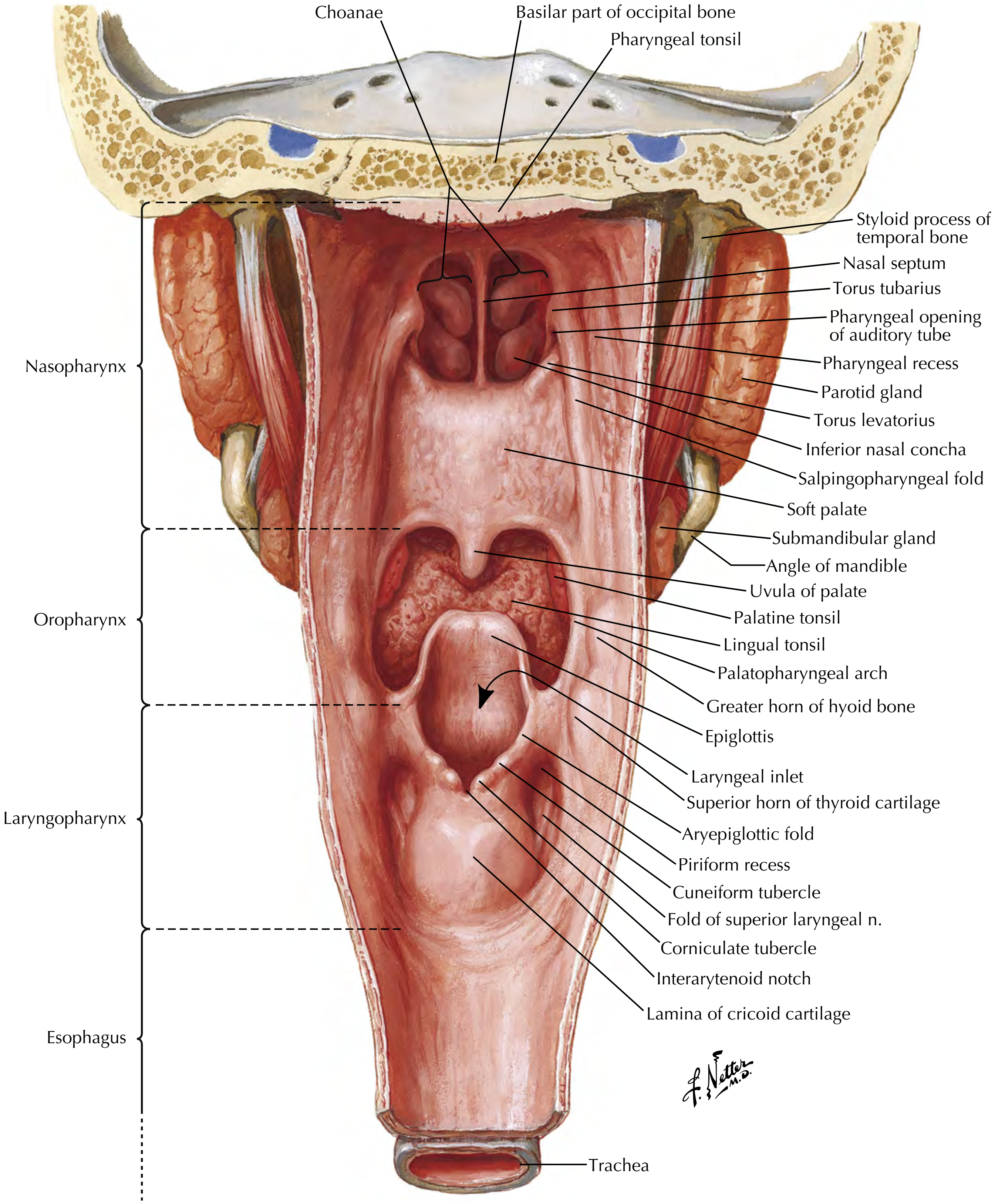
Superior view of the skull base showing line of cut and the removed part



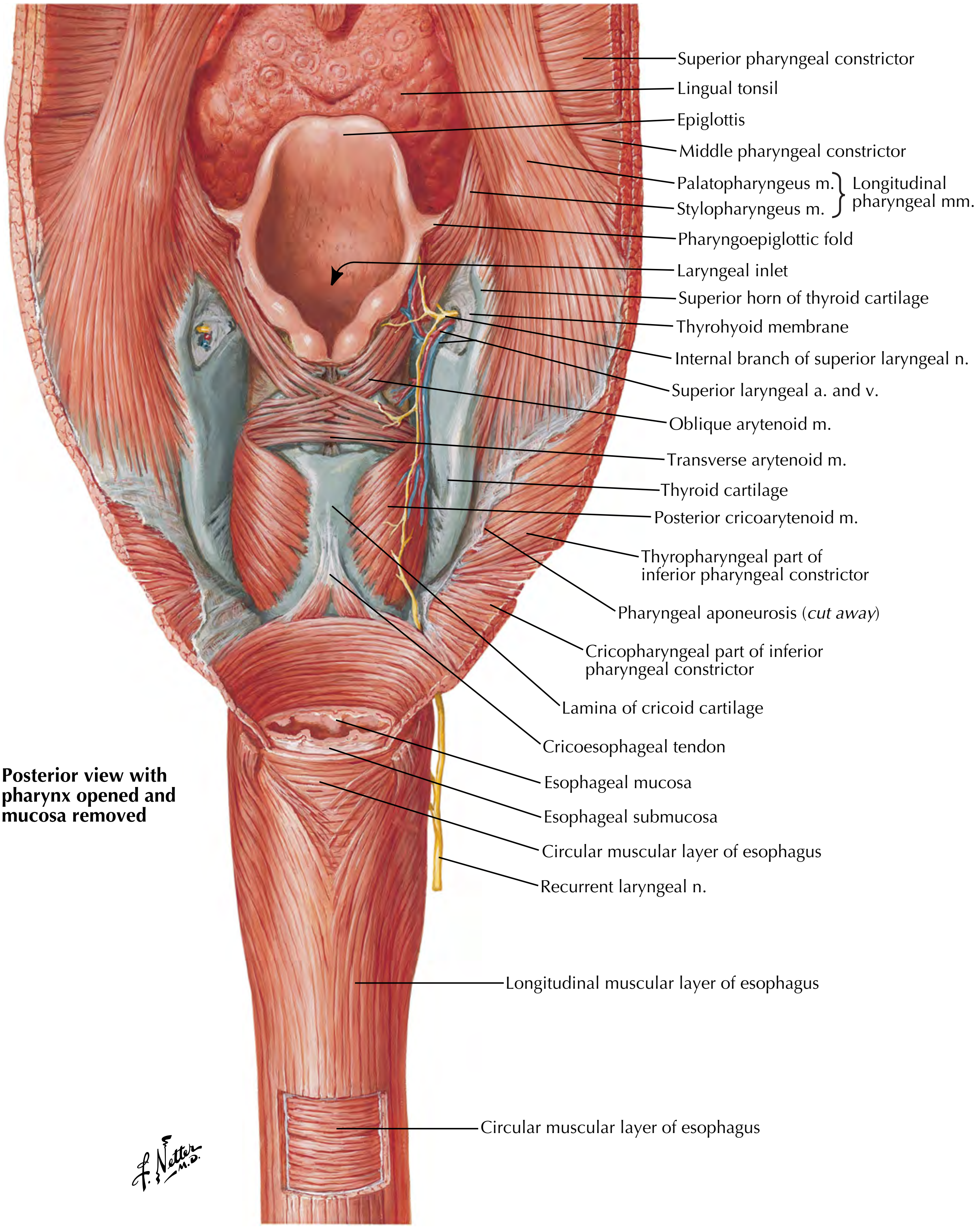
Vestibulocochlear n. (CN VIII)
Glossopharyngeal n. (CN IX)
Facial n. (CN VII)
Inferior ganglion of vagus n.
Superior ganglion of vagus n.
Stylomastoid a.
Facial n. (CN VII)
Sigmoid sinus
Occipital a.
Hypoglossal n. (CN XII)
Spinal accessory n. (CN XI)
Ascending pharyngeal a.
Stylopharyngeus m.
Superficial temporal a.
Glossopharyngeal n. (CN IX)
Vagus n. (CN X) (*cut*)
Internal carotid a.
Superior cervical ganglion
External carotid a.
Superior laryngeal n.
Facial a.
Angle of mandible
Superior thyroid a.
Pharyngeal branch of vagus n.
Pharyngeal venous plexus
Internal jugular v.
Internal carotid a.
Pharyngeal plexus
Common carotid a.
Superior cervical cardiac n.
Inferior thyroid a.
Sympathetic trunk
Thyrocervical trunk
Thyroid gland
Parathyroid gland
Vertebral a.
Middle cervical ganglion
Subclavian a.
Common carotid a.
Esophagus
C.Machado M.D.
Recurrent laryngeal n.

See also **Plates 91, 97**


Basilar part of occipital bone
Pharyngeal tubercle
Pharyngeal tonsil
Cartilage of auditory tube
Styloid process of temporal bone
Pharyngobasilar fascia
Choana
Posterior belly of digastric m.
Levator veli palatini
Stylohyoid m.
Superior pharyngeal constrictor
Stylopharyngeus m.
Salpingopharyngeus m.
Petropharyngeus m.
Musculus uvulae
Palatopharyngeus m.
Medial pterygoid m.
Middle pharyngeal constrictor
Pharyngobasilar fascia
Lingual tonsil
Stylopharyngeus m.
Pharyngeal raphe
Superior pharyngeal constrictor
Pharyngoepiglottic fold
Greater horn of hyoid bone
Aryepiglottic fold
Middle pharyngeal constrictor
Inferior pharyngeal constrictor (*cut edge*)
Epiglottis
Inferior pharyngeal constrictor
Superior horn of thyroid cartilage
Cuneiform tubercle
Thyrohyoid membrane
Corniculate tubercle
Oblique arytenoid m.
Internal branch of superior laryngeal n.
Transverse arytenoid m.
Posterior cricoarytenoid m.
Cricopharyngeal part of inferior pharyngeal constrictor
Cricopharyngeal part of inferior pharyngeal constrictor
Lamina of thyroid cartilage
Cricoesophageal tendon
Longitudinal muscular layer of esophagus
Circular muscular layer of esophagus
F. Netter M.D.


Choanae
Basilar part of occipital bone
Pharyngeal tonsil
Styloid process of temporal bone
Nasal septum
Torus tubarius
Pharyngeal opening of auditory tube
Pharyngeal recess
Parotid gland
Torus levatorius
Inferior nasal concha
Salpingopharyngeal fold
Soft palate
Submandibular gland
Angle of mandible
Uvula of palate
Palatine tonsil
Lingual tonsil
Palatopharyngeal arch
Greater horn of hyoid bone
Epiglottis
Laryngeal inlet
Superior horn of thyroid cartilage
Aryepiglottic fold
Piriform recess
Cuneiform tubercle
Fold of superior laryngeal n.
Corniculate tubercle
Interarytenoid notch
Lamina of cricoid cartilage
Trachea
Nasopharynx
Oropharynx
Laryngopharynx
Esophagus

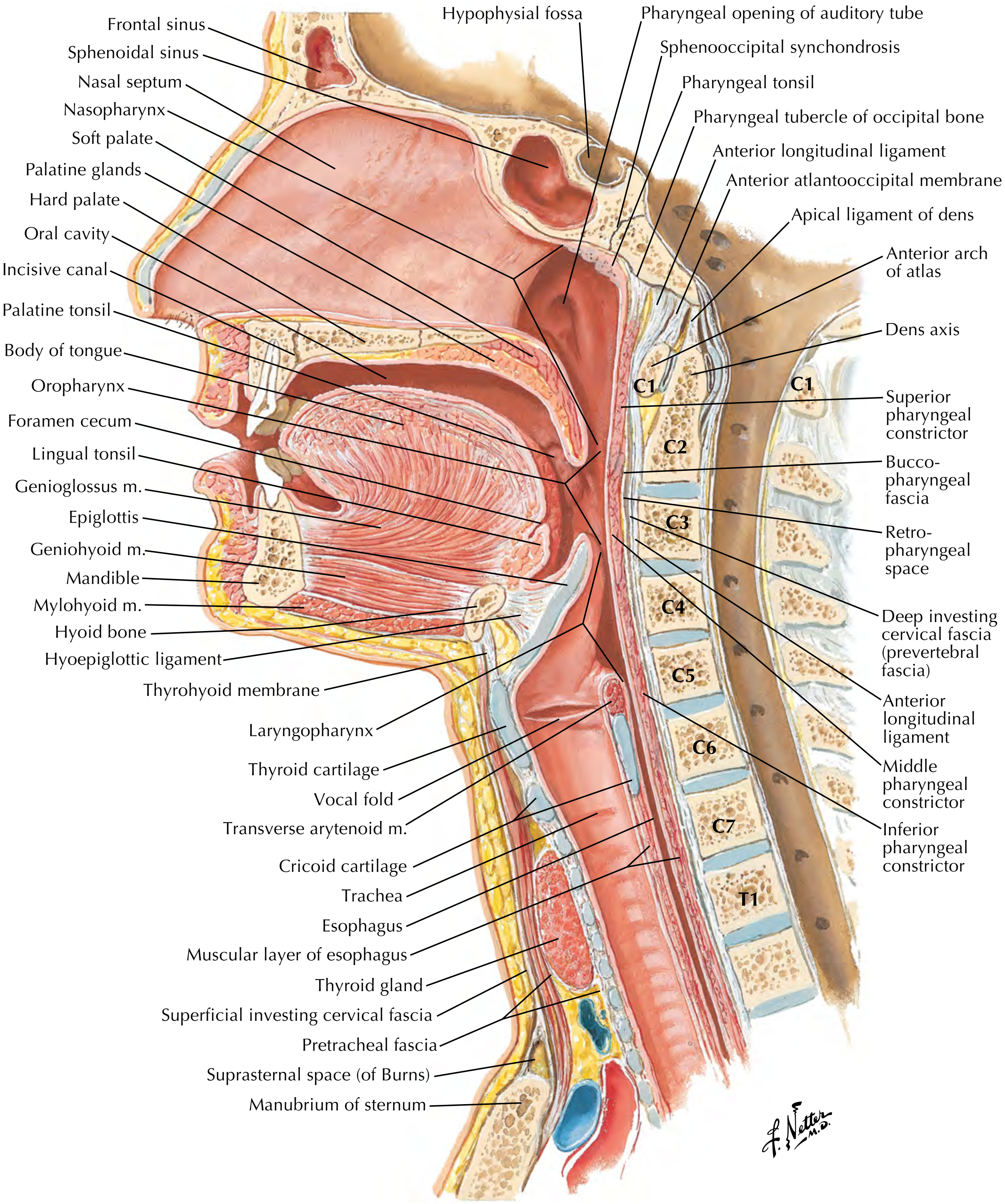
See also **Plates 106, 107, 108**


Superior pharyngeal constrictor
Lingual tonsil
Epiglottis
Middle pharyngeal constrictor
Palatopharyngeus m.
Stylopharyngeus m.
Longitudinal pharyngeal mm.
Pharyngoepiglottic fold
Laryngeal inlet
Superior horn of thyroid cartilage
Thyrohyoid membrane
Internal branch of superior laryngeal n.
Superior laryngeal a. and v.
Oblique arytenoid m.
Transverse arytenoid m.
Thyroid cartilage
Posterior cricoarytenoid m.
Thyropharyngeal part of inferior pharyngeal constrictor
Pharyngeal aponeurosis (*cut away*)
Cricopharyngeal part of inferior pharyngeal constrictor
Lamina of cricoid cartilage
Cricoesophageal tendon
Esophageal mucosa
Esophageal submucosa
Circular muscular layer of esophagus
Recurrent laryngeal n.
Longitudinal muscular layer of esophagus
Circular muscular layer of esophagus
F. Netter M.D.

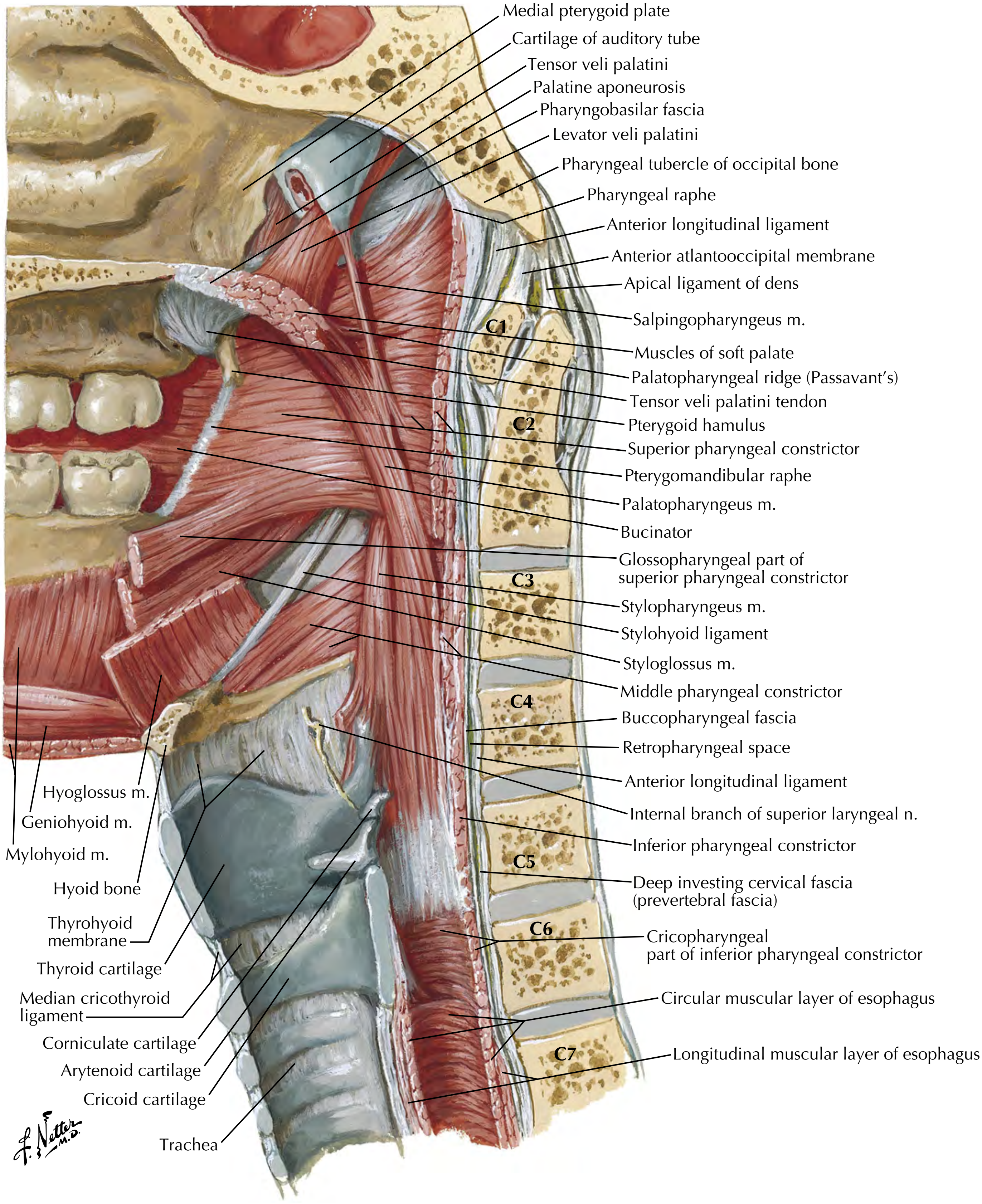
Posterior view with pharynx opened and mucosa removed

Pharynx: Medial View

See also **Plate BP 26**

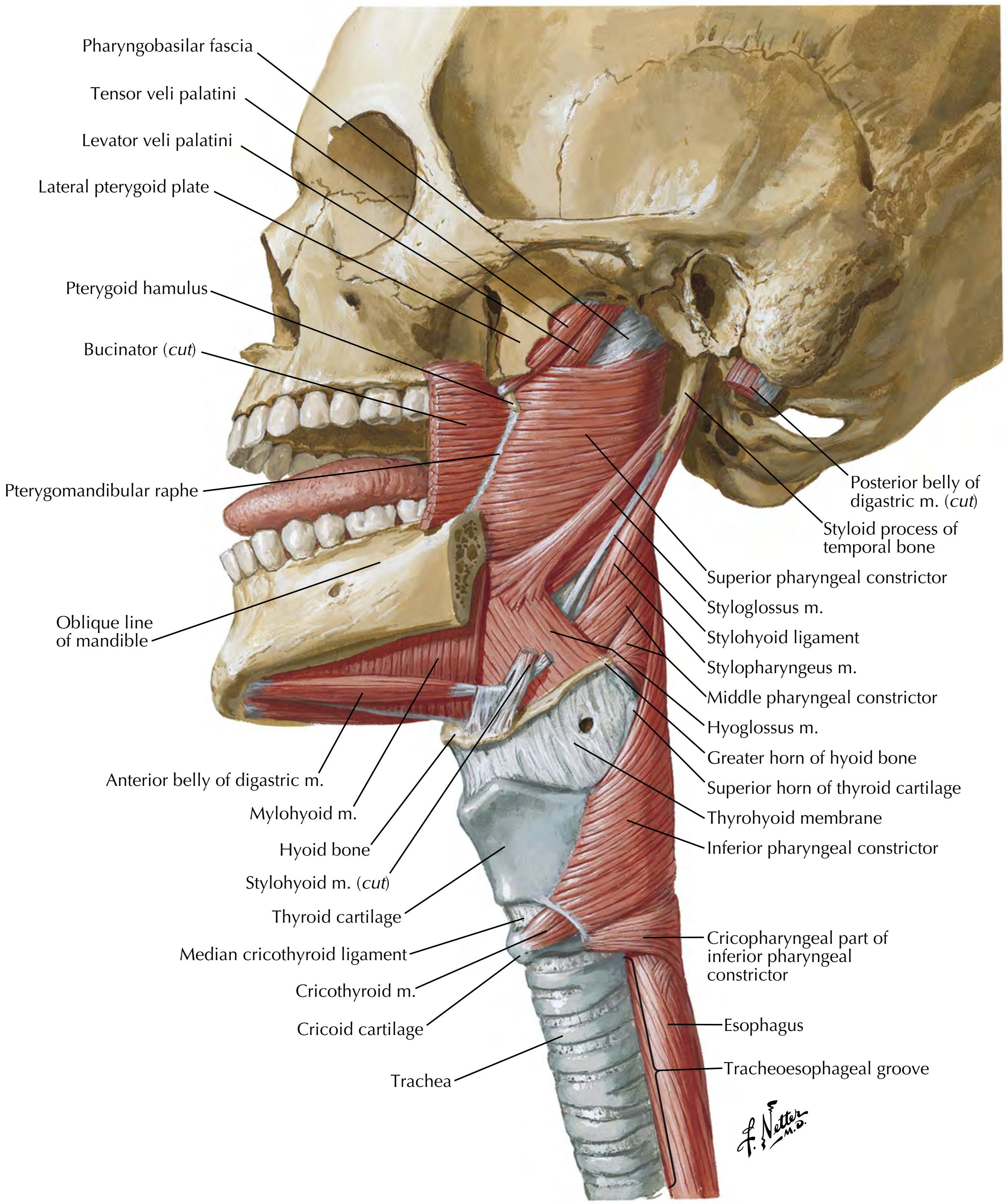

Frontal sinus
Sphenoidal sinus
Nasal septum
Nasopharynx
Soft palate
Palatine glands
Hard palate
Oral cavity
Incisive canal
Palatine tonsil
Body of tongue
Oropharynx
Foramen cecum
Lingual tonsil
Genioglossus m.
Epiglottis
Geniohyoid m.
Mandible
Mylohyoid m.
Hyoid bone
Hyoepiglottic ligament
Thyrohyoid membrane
Laryngopharynx
Thyroid cartilage
Vocal fold
Transverse arytenoid m.
Cricoid cartilage
Trachea
Esophagus
Muscular layer of esophagus
Thyroid gland
Superficial investing cervical fascia
Pretracheal fascia
Suprasternal space (of Burns)
Manubrium of sternum
Hypophysial fossa
Pharyngeal opening of auditory tube
Sphenooccipital synchondrosis
Pharyngeal tonsil
Pharyngeal tubercle of occipital bone
Anterior longitudinal ligament
Anterior atlantooccipital membrane
Apical ligament of dens
Anterior arch of atlas
Dens axis
Superior pharyngeal constrictor
Bucco-pharyngeal fascia
Retro-pharyngeal space
Deep investing cervical fascia (prevertebral fascia)
Anterior longitudinal ligament
Middle pharyngeal constrictor
Inferior pharyngeal constrictor
C1
C1
C2
C3
C4
C5
C6
C7
T1

See also **Plate 77**


Medial pterygoid plate
Cartilage of auditory tube
Tensor veli palatini
Palatine aponeurosis
Pharyngobasilar fascia
Levator veli palatini
Pharyngeal tubercle of occipital bone
Pharyngeal raphe
Anterior longitudinal ligament
Anterior atlantooccipital membrane
Apical ligament of dens
Salpingopharyngeus m.
Muscles of soft palate
Palatopharyngeal ridge (Passavant's)
Tensor veli palatini tendon
Pterygoid hamulus
Superior pharyngeal constrictor
Pterygomandibular raphe
Palatopharyngeus m.
Bucinator
Glossopharyngeal part of superior pharyngeal constrictor
Stylopharyngeus m.
Stylohyoid ligament
Styloglossus m.
Middle pharyngeal constrictor
Buccopharyngeal fascia
Retropharyngeal space
Anterior longitudinal ligament
Internal branch of superior laryngeal n.
Inferior pharyngeal constrictor
Deep investing cervical fascia (prevertebral fascia)
Cricopharyngeal part of inferior pharyngeal constrictor
Circular muscular layer of esophagus
Longitudinal muscular layer of esophagus
C1
C2
C3
C4
C5
C6
C7
Hyoglossus m.
Geniohyoid m.
Mylohyoid m.
Hyoid bone
Thyrohyoid membrane
Thyroid cartilage
Median cricothyroid ligament
Corniculate cartilage
Arytenoid cartilage
Cricoid cartilage
Trachea
F. Netter M.D.

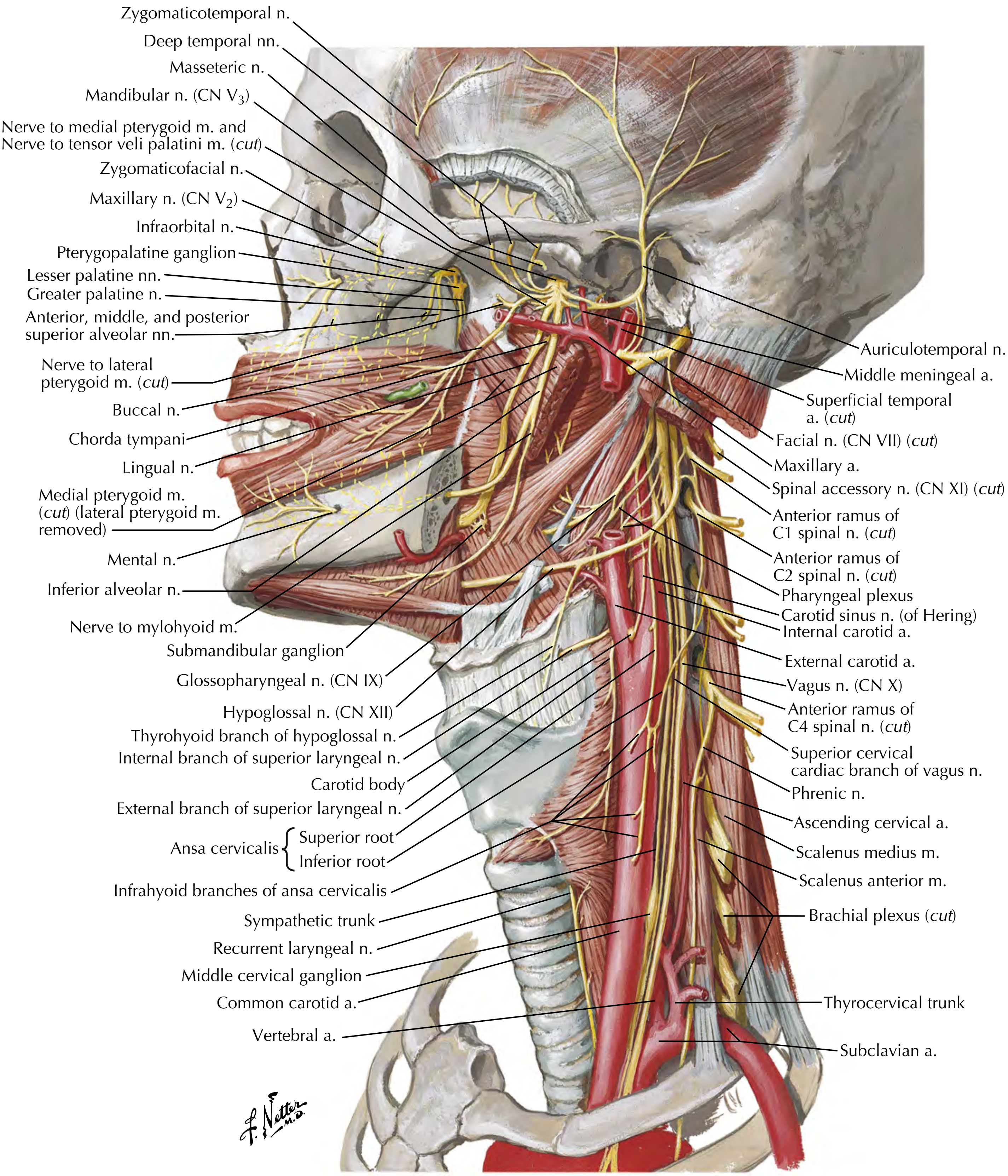
Muscles of Pharynx: Lateral View

See also **Plate 92**

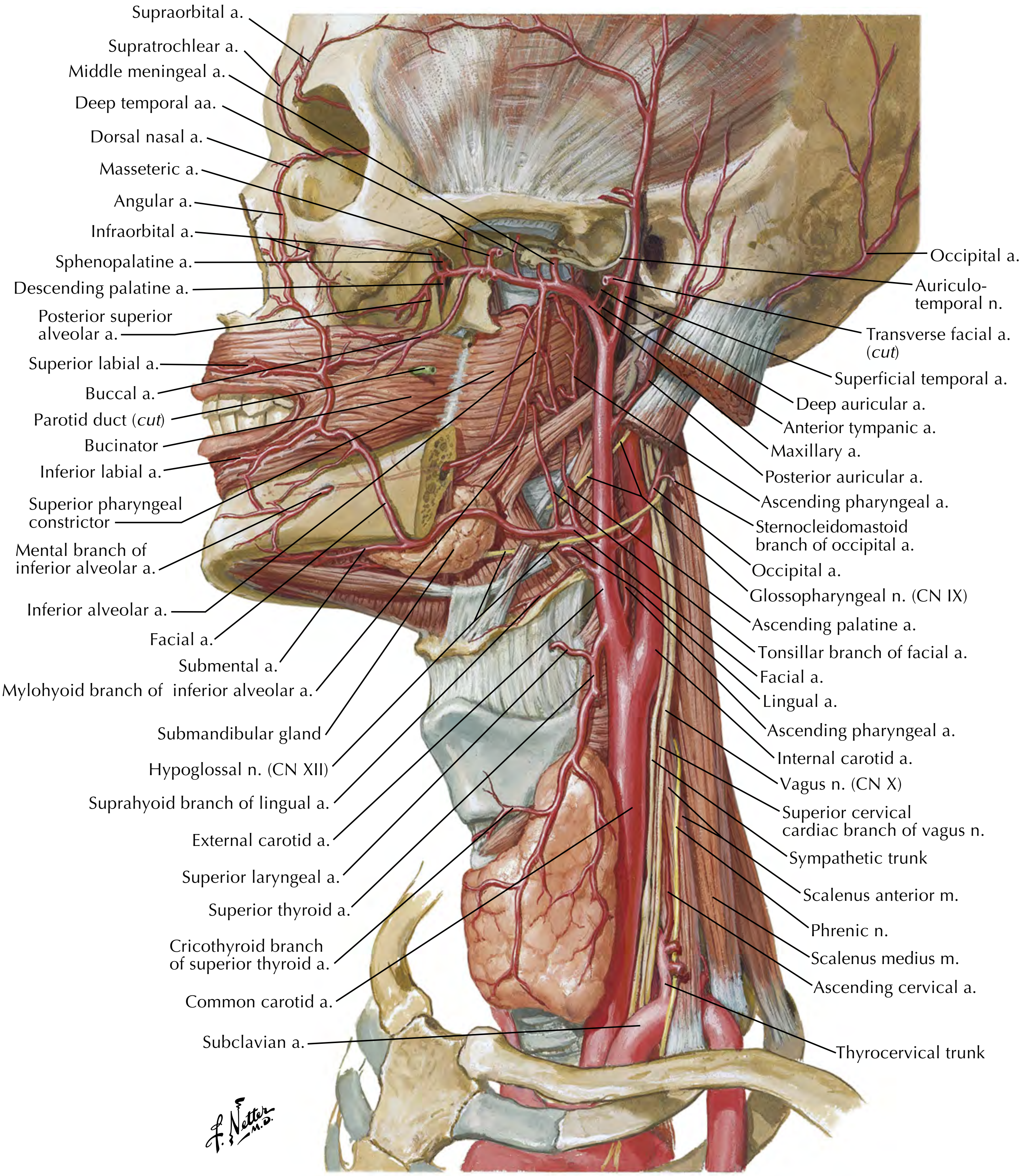

Pharyngobasilar fascia
Tensor veli palatini
Levator veli palatini
Lateral pterygoid plate
Pterygoid hamulus
Bucinator (*cut*)
Pterygomandibular raphe
Oblique line of mandible
Anterior belly of digastric m.
Mylohyoid m.
Hyoid bone
Stylohyoid m. (*cut*)
Thyroid cartilage
Median cricothyroid ligament
Cricothyroid m.
Cricoid cartilage
Trachea
Posterior belly of digastric m. (*cut*)
Styloid process of temporal bone
Superior pharyngeal constrictor
Styloglossus m.
Stylohyoid ligament
Stylopharyngeus m.
Middle pharyngeal constrictor
Hyoglossus m.
Greater horn of hyoid bone
Superior horn of thyroid cartilage
Thyrohyoid membrane
Inferior pharyngeal constrictor
Cricopharyngeal part of inferior pharyngeal constrictor
Esophagus
Tracheoesophageal groove
F. Netter M.D.

Nerves of Oral and Pharyngeal Regions

See also **Plates 77, 149, 152**

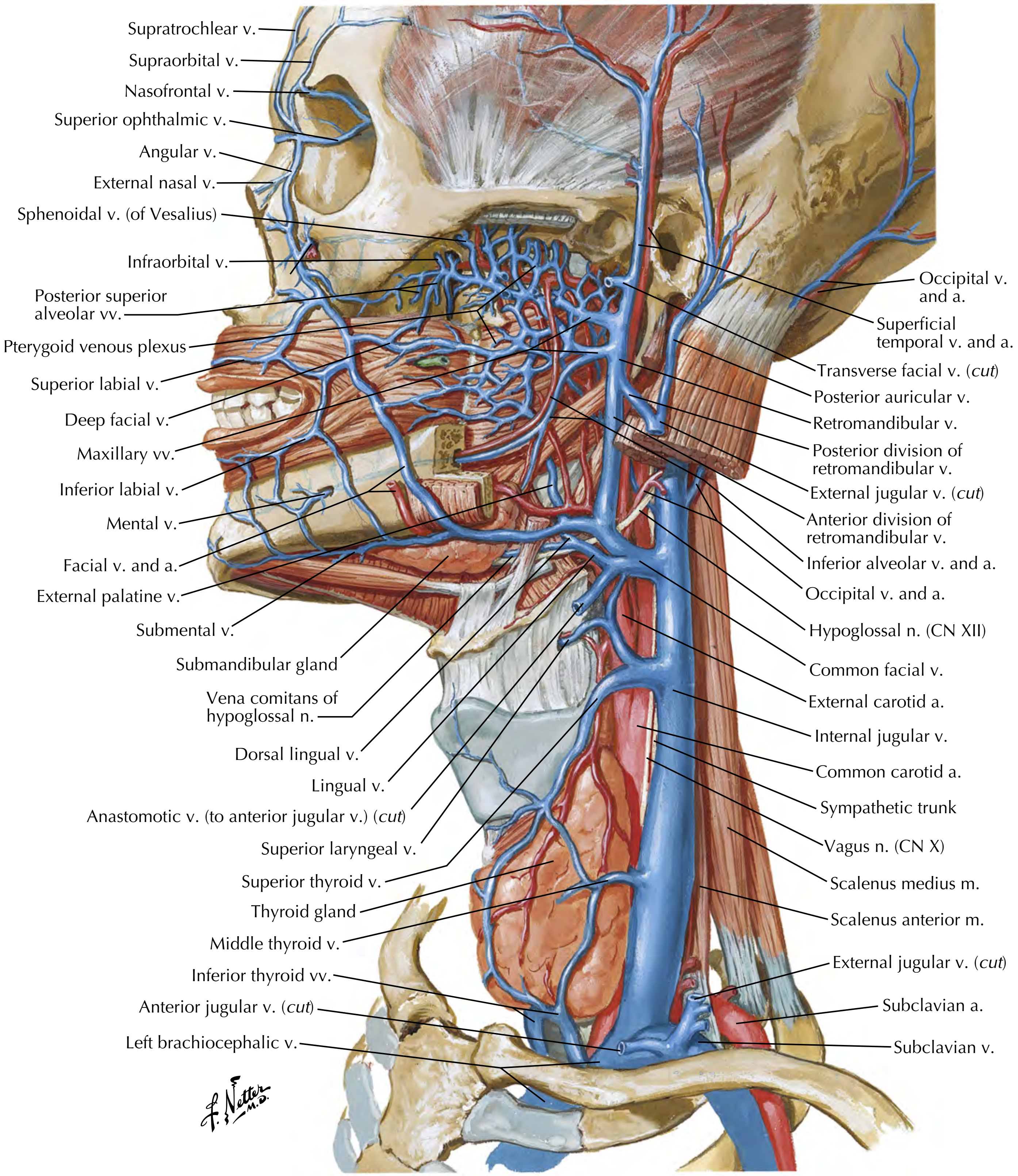

Zygomaticotemporal n.
Deep temporal nn.
Masseteric n.
Mandibular n. (CN V_3)
Nerve to medial pterygoid m. and Nerve to tensor veli palatini m. (*cut*)
Zygomaticofacial n.
Maxillary n. (CN V_2)
Infraorbital n.
Pterygopalatine ganglion
Lesser palatine nn.
Greater palatine n.
Anterior, middle, and posterior superior alveolar nn.
Nerve to lateral pterygoid m. (*cut*)
Buccal n.
Chorda tympani
Lingual n.
Medial pterygoid m. (*cut*) (lateral pterygoid m. removed)
Mental n.
Inferior alveolar n.
Nerve to mylohyoid m.
Submandibular ganglion
Glossopharyngeal n. (CN IX)
Hypoglossal n. (CN XII)
Thyrohyoid branch of hypoglossal n.
Internal branch of superior laryngeal n.
Carotid body
External branch of superior laryngeal n.
Ansa cervicalis { Superior root
Inferior root
Infrahyoid branches of ansa cervicalis
Sympathetic trunk
Recurrent laryngeal n.
Middle cervical ganglion
Common carotid a.
Vertebral a.
Auriculotemporal n.
Middle meningeal a.
Superficial temporal a. (*cut*)
Facial n. (CN VII) (*cut*)
Maxillary a.
Spinal accessory n. (CN XI) (*cut*)
Anterior ramus of C1 spinal n. (*cut*)
Anterior ramus of C2 spinal n. (*cut*)
Pharyngeal plexus
Carotid sinus n. (of Hering)
Internal carotid a.
External carotid a.
Vagus n. (CN X)
Anterior ramus of C4 spinal n. (*cut*)
Superior cervical cardiac branch of vagus n.
Phrenic n.
Ascending cervical a.
Scalenus medius m.
Scalenus anterior m.
Brachial plexus (*cut*)
Thyrocervical trunk
Subclavian a.
F. Netter M.D.

See also **Plates 58, 74**


Supraorbital a.
Supratrochlear a.
Middle meningeal a.
Deep temporal aa.
Dorsal nasal a.
Masseteric a.
Angular a.
Infraorbital a.
Sphenopalatine a.
Descending palatine a.
Posterior superior alveolar a.
Superior labial a.
Buccal a.
Parotid duct (*cut*)
Bucinator
Inferior labial a.
Superior pharyngeal constrictor
Mental branch of inferior alveolar a.
Inferior alveolar a.
Facial a.
Submental a.
Mylohyoid branch of inferior alveolar a.
Submandibular gland
Hypoglossal n. (CN XII)
Suprahyoid branch of lingual a.
External carotid a.
Superior laryngeal a.
Superior thyroid a.
Cricothyroid branch of superior thyroid a.
Common carotid a.
Subclavian a.
Occipital a.
Auriculotemporal n.
Transverse facial a. (*cut*)
Superficial temporal a.
Deep auricular a.
Anterior tympanic a.
Maxillary a.
Posterior auricular a.
Ascending pharyngeal a.
Sternocleidomastoid branch of occipital a.
Occipital a.
Glossopharyngeal n. (CN IX)
Ascending palatine a.
Tonsillar branch of facial a.
Facial a.
Lingual a.
Ascending pharyngeal a.
Internal carotid a.
Vagus n. (CN X)
Superior cervical cardiac branch of vagus n.
Sympathetic trunk
Scalenus anterior m.
Phrenic n.
Scalenus medius m.
Ascending cervical a.
Thyrocervical trunk
F. Netter M.D.

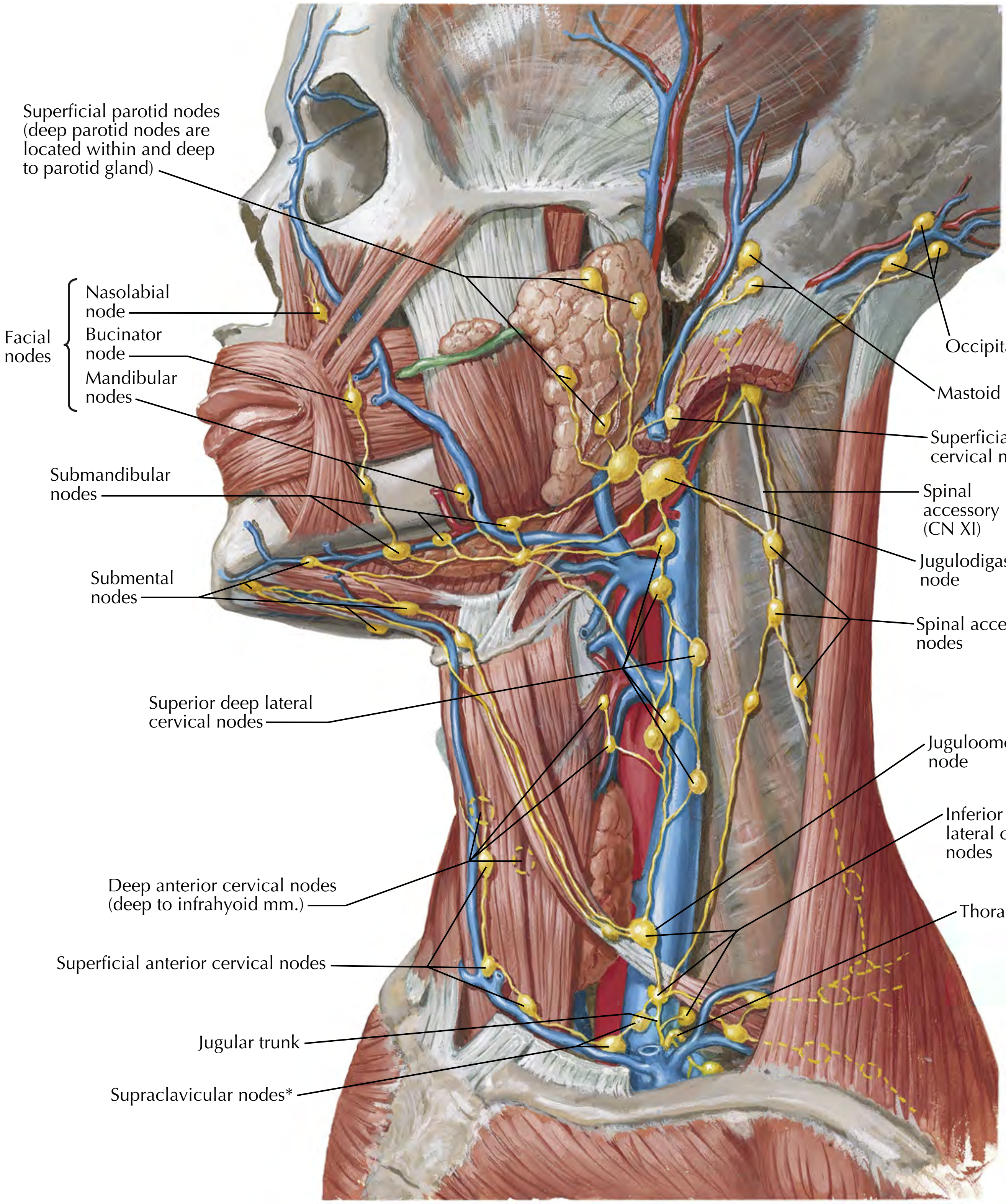
Veins of Head and Neck

See also **Plate 101**

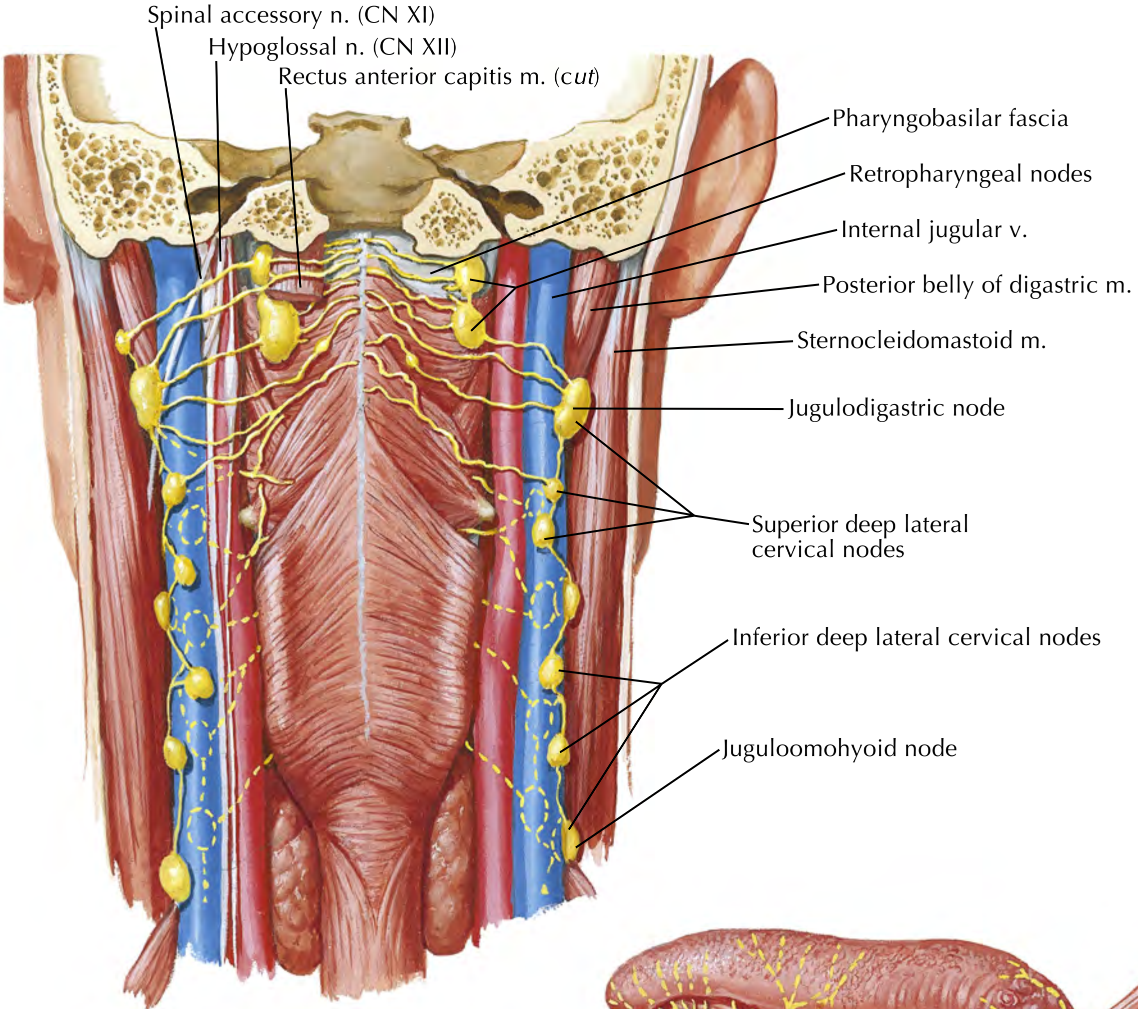

Supratrochlear v.
Supraorbital v.
Nasofrontal v.
Superior ophthalmic v.
Angular v.
External nasal v.
Sphenoidal v. (of Vesalius)
Infraorbital v.
Posterior superior alveolar vv.
Pterygoid venous plexus
Superior labial v.
Deep facial v.
Maxillary vv.
Inferior labial v.
Mental v.
Facial v. and a.
External palatine v.
Submental v.
Submandibular gland
Vena comitans of hypoglossal n.
Dorsal lingual v.
Lingual v.
Anastomotic v. (to anterior jugular v.) (*cut*)
Superior laryngeal v.
Superior thyroid v.
Thyroid gland
Middle thyroid v.
Inferior thyroid vv.
Anterior jugular v. (*cut*)
Left brachiocephalic v.
Occipital v. and a.
Superficial temporal v. and a.
Transverse facial v. (*cut*)
Posterior auricular v.
Retromandibular v.
Posterior division of retromandibular v.
External jugular v. (*cut*)
Anterior division of retromandibular v.
Inferior alveolar v. and a.
Occipital v. and a.
Hypoglossal n. (CN XII)
Common facial v.
External carotid a.
Internal jugular v.
Common carotid a.
Sympathetic trunk
Vagus n. (CN X)
Scalenus medius m.
Scalenus anterior m.
External jugular v. (*cut*)
Subclavian a.
Subclavian v.

Lymph Nodes of Head and Neck

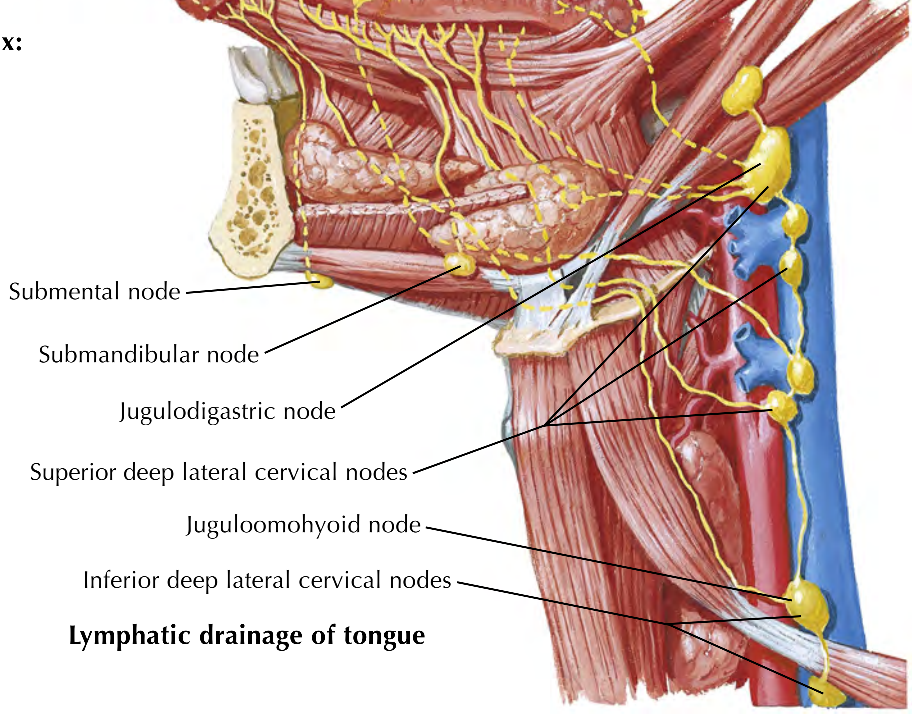
See also **Plate 260**


Superficial parotid nodes (deep parotid nodes are located within and deep to parotid gland)
Facial nodes
Nasolabial node
Bucinator node
Mandibular nodes
Submandibular nodes
Submental nodes
Superior deep lateral cervical nodes
Deep anterior cervical nodes (deep to infrahyoid mm.)
Superficial anterior cervical nodes
Jugular trunk
Supraclavicular nodes*
Occipital nodes
Mastoid nodes
Superficial lateral cervical node
Spinal accessory n. (CN XI)
Jugulodigastric node
Spinal accessory nodes
Juguloomohyoid node
Inferior deep lateral cervical nodes
Thoracic duct

**The supraclavicular group of nodes, especially on the left, are also sometimes referred to as the signal or sentinel lymph nodes of Virchow or Troisier, especially when sufficiently enlarged and palpable. These nodes (or a single node) are so termed because they may be the first recognized presumptive evidence of malignant disease in the viscera.*


Spinal accessory n. (CN XI)
Hypoglossal n. (CN XII)
Rectus anterior capitis m. (*cut*)
Pharyngobasilar fascia
Retropharyngeal nodes
Internal jugular v.
Posterior belly of digastric m.
Sternocleidomastoid m.
Jugulodigastric node
Superior deep lateral cervical nodes
Inferior deep lateral cervical nodes
Juguloomohyoid node

Lymphatic drainage of pharynx: posterior view


Submental node
Submandibular node
Jugulodigastric node
Superior deep lateral cervical nodes
Juguloomohyoid node
Inferior deep lateral cervical nodes

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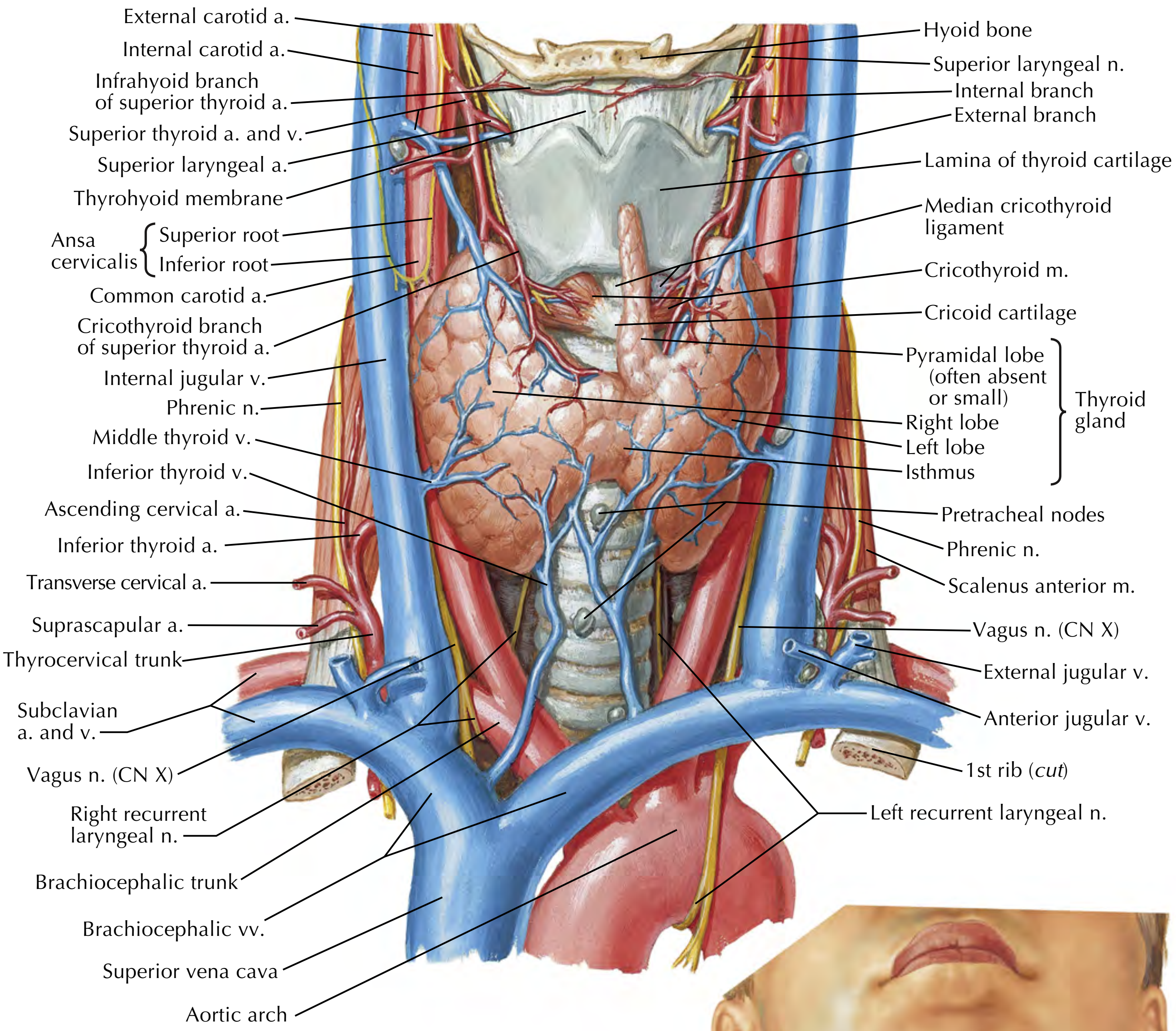
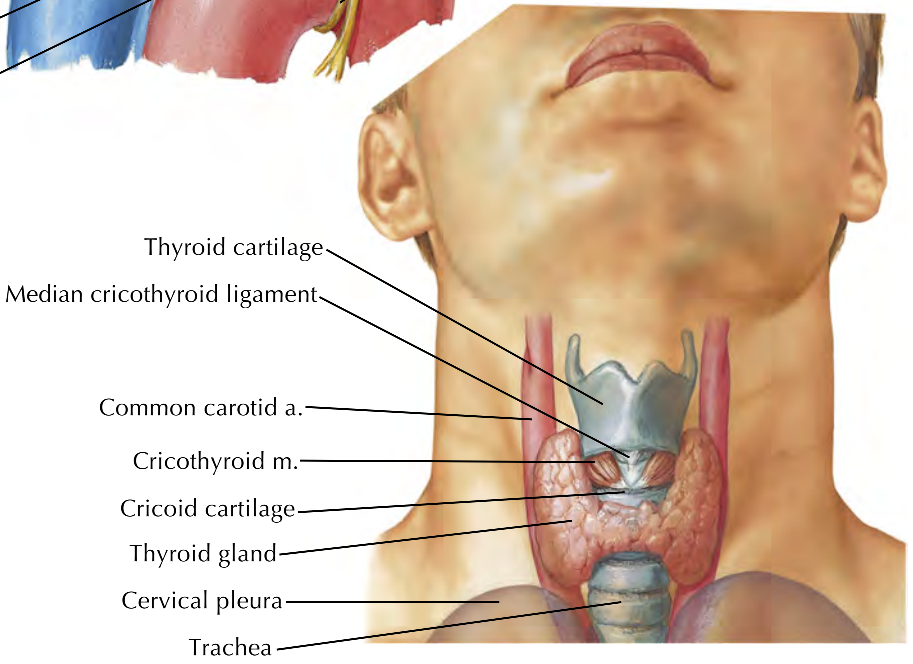
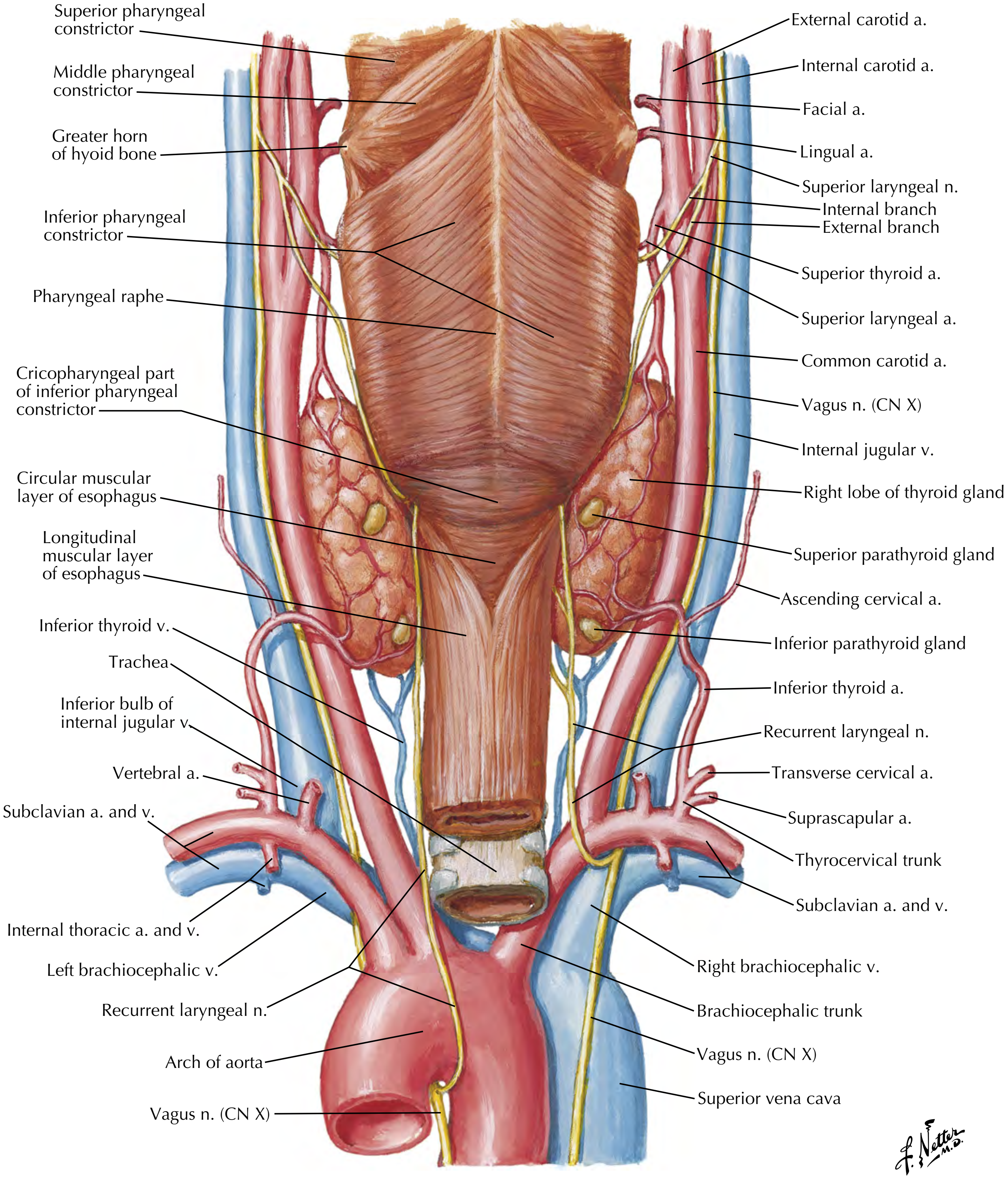
Lymphatic drainage of tongue


External carotid a.
Internal carotid a.
Infrahyoid branch of superior thyroid a.
Superior thyroid a. and v.
Superior laryngeal a.
Thyrohyoid membrane
Ansa cervicalis
Superior root
Inferior root
Common carotid a.
Cricothyroid branch of superior thyroid a.
Internal jugular v.
Phrenic n.
Middle thyroid v.
Inferior thyroid v.
Ascending cervical a.
Inferior thyroid a.
Transverse cervical a.
Suprascapular a.
Thyrocervical trunk
Subclavian a. and v.
Vagus n. (CN X)
Right recurrent laryngeal n.
Brachiocephalic trunk
Brachiocephalic vv.
Superior vena cava
Aortic arch
Hyoid bone
Superior laryngeal n.
Internal branch
External branch
Lamina of thyroid cartilage
Median cricothyroid ligament
Cricothyroid m.
Cricoid cartilage
Pyramidal lobe (often absent or small)
Right lobe
Left lobe
Isthmus
Thyroid gland
Pretracheal nodes
Phrenic n.
Scalenus anterior m.
Vagus n. (CN X)
External jugular v.
Anterior jugular v.
1st rib (*cut*)
Left recurrent laryngeal n.

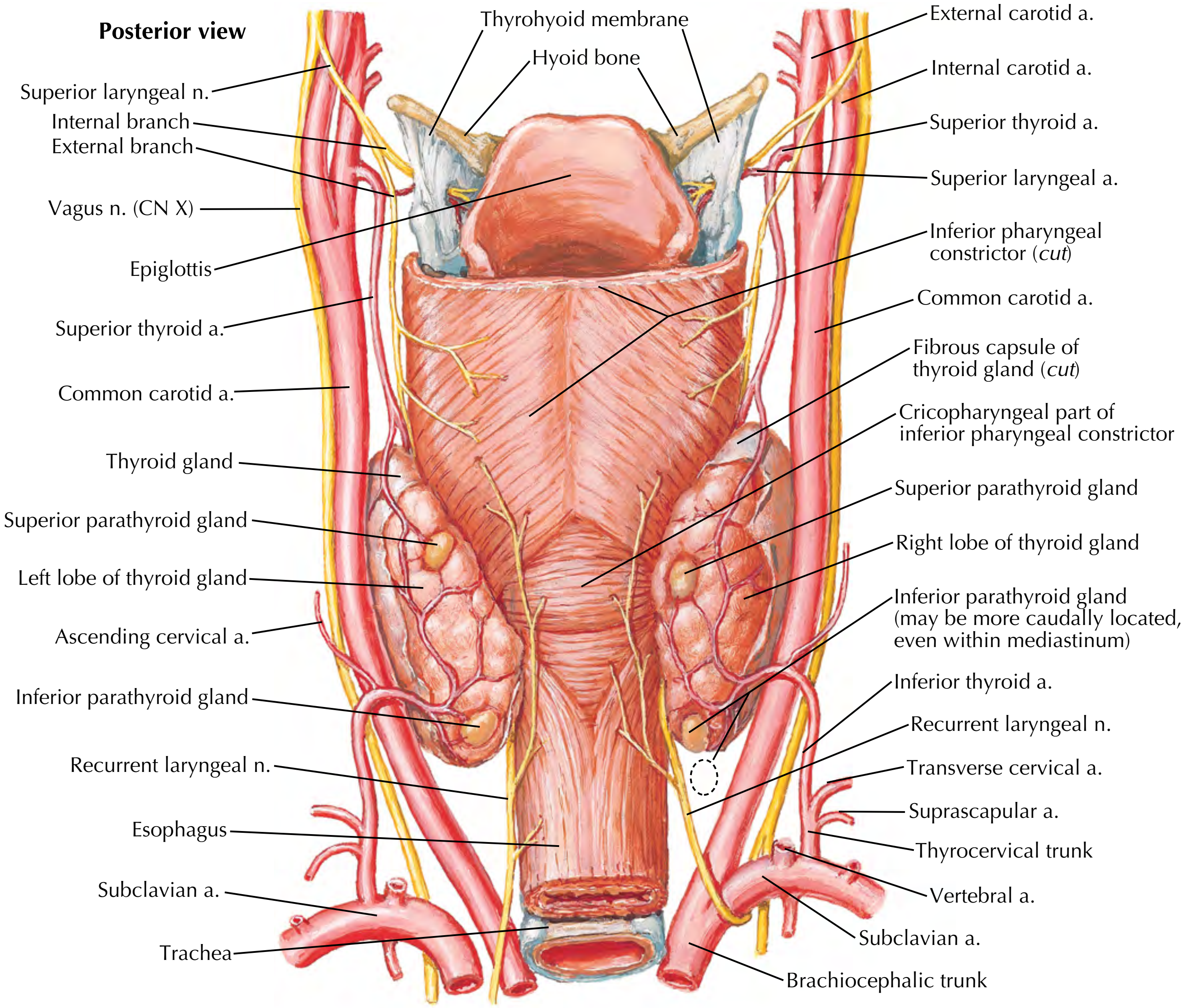

Thyroid cartilage
Median cricothyroid ligament
Common carotid a.
Cricothyroid m.
Cricoid cartilage
Thyroid gland
Cervical pleura
Trachea

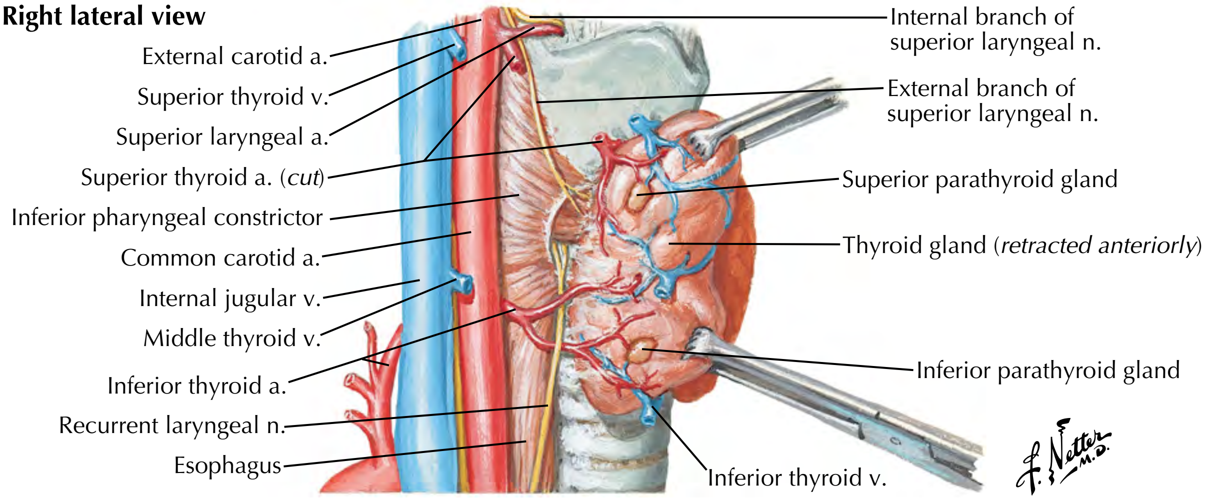
See also **Plate 105**


Superior pharyngeal constrictor
Middle pharyngeal constrictor
Greater horn of hyoid bone
Inferior pharyngeal constrictor
Pharyngeal raphe
Cricopharyngeal part of inferior pharyngeal constrictor
Circular muscular layer of esophagus
Longitudinal muscular layer of esophagus
Inferior thyroid v.
Trachea
Inferior bulb of internal jugular v.
Vertebral a.
Subclavian a. and v.
Internal thoracic a. and v.
Left brachiocephalic v.
Recurrent laryngeal n.
Arch of aorta
Vagus n. (CN X)
External carotid a.
Internal carotid a.
Facial a.
Lingual a.
Superior laryngeal n.
Internal branch
External branch
Superior thyroid a.
Superior laryngeal a.
Common carotid a.
Vagus n. (CN X)
Internal jugular v.
Right lobe of thyroid gland
Superior parathyroid gland
Ascending cervical a.
Inferior parathyroid gland
Inferior thyroid a.
Recurrent laryngeal n.
Transverse cervical a.
Suprascapular a.
Thyrocervical trunk
Subclavian a. and v.
Right brachiocephalic v.
Brachiocephalic trunk
Vagus n. (CN X)
Superior vena cava
F. Netter M.D.

Thyroid and Parathyroid Glands

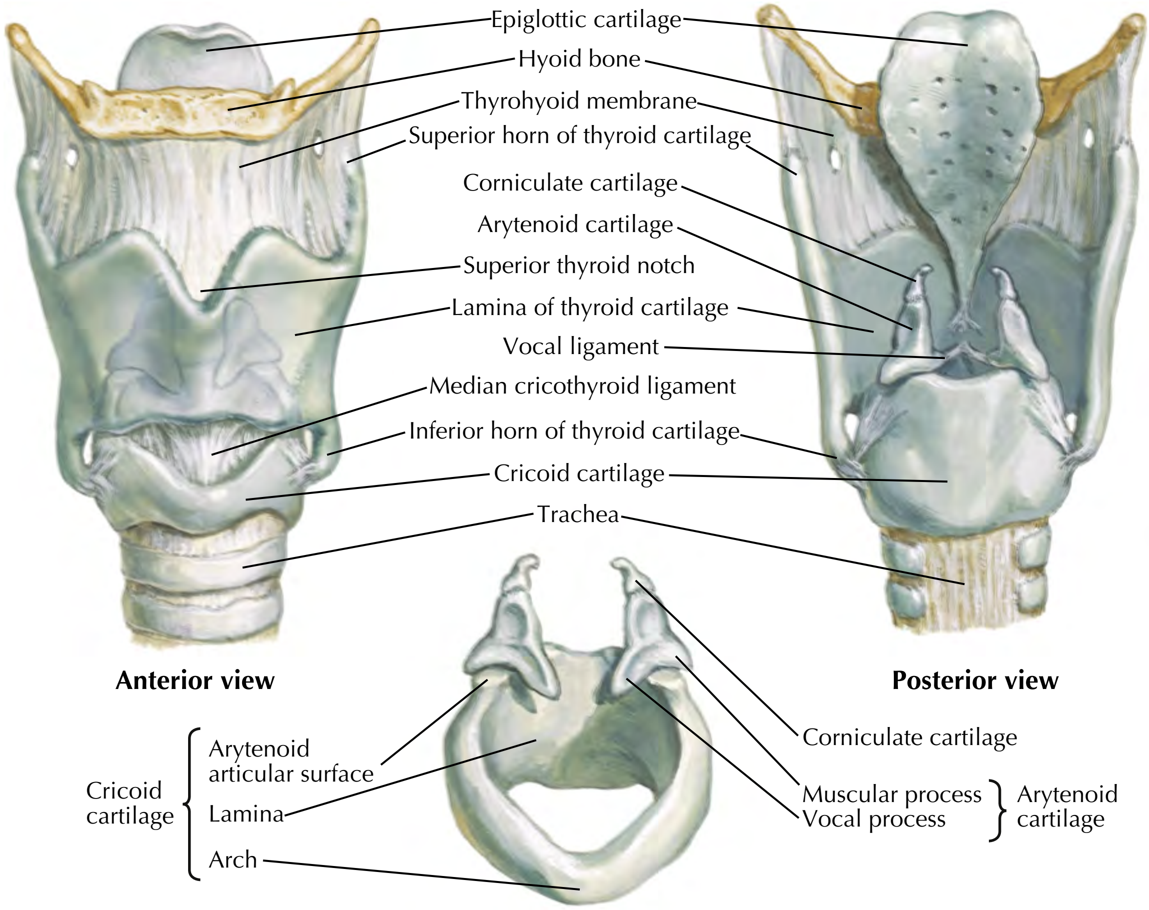
See also **Plates 94, 104, 108**


Posterior view
Superior laryngeal n.
Internal branch
External branch
Vagus n. (CN X)
Epiglottis
Superior thyroid a.
Common carotid a.
Thyroid gland
Superior parathyroid gland
Left lobe of thyroid gland
Ascending cervical a.
Inferior parathyroid gland
Recurrent laryngeal n.
Esophagus
Subclavian a.
Trachea
Thyrohyoid membrane
Hyoid bone
External carotid a.
Internal carotid a.
Superior thyroid a.
Superior laryngeal a.
Inferior pharyngeal constrictor (*cut*)
Common carotid a.
Fibrous capsule of thyroid gland (*cut*)
Cricopharyngeal part of inferior pharyngeal constrictor
Superior parathyroid gland
Right lobe of thyroid gland
Inferior parathyroid gland (may be more caudally located, even within mediastinum)
Inferior thyroid a.
Recurrent laryngeal n.
Transverse cervical a.
Suprascapular a.
Thyrocervical trunk
Vertebral a.
Subclavian a.
Brachiocephalic trunk


Right lateral view
External carotid a.
Superior thyroid v.
Superior laryngeal a.
Superior thyroid a. (*cut*)
Inferior pharyngeal constrictor
Common carotid a.
Internal jugular v.
Middle thyroid v.
Inferior thyroid a.
Recurrent laryngeal n.
Esophagus
Internal branch of superior laryngeal n.
External branch of superior laryngeal n.
Superior parathyroid gland
Thyroid gland (*retracted anteriorly*)
Inferior parathyroid gland
Inferior thyroid v.

Cartilages of Larynx

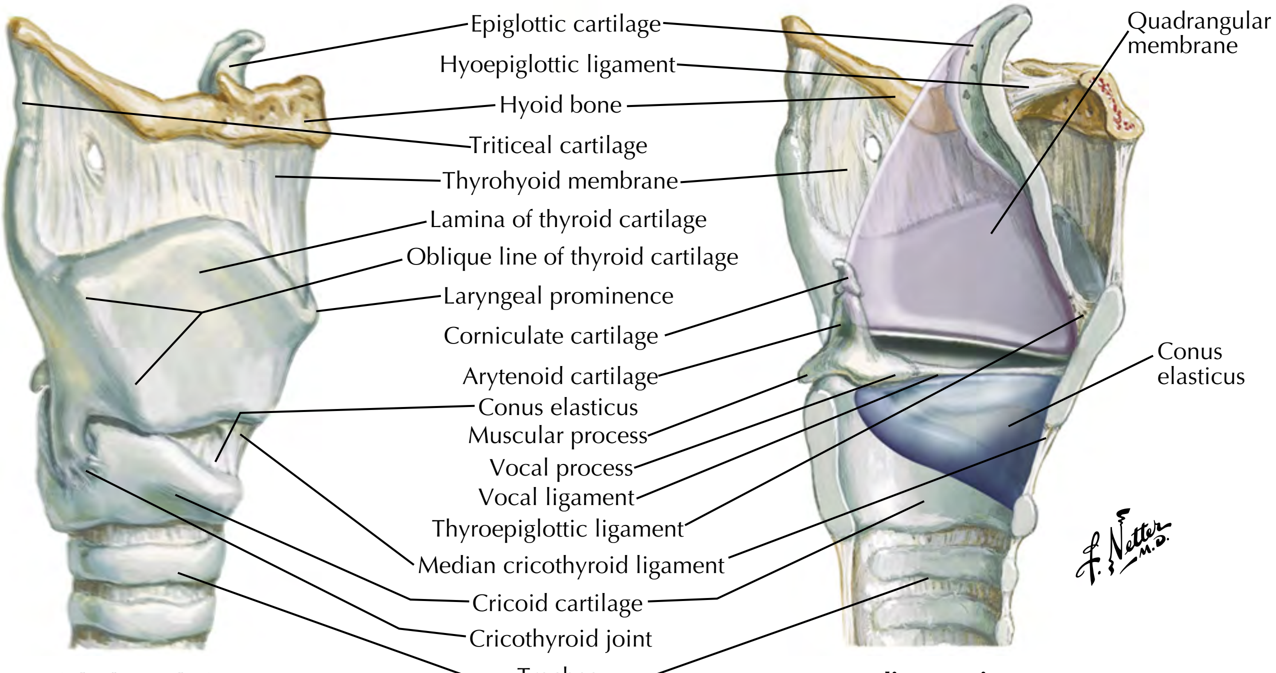
See also **Plates 107, 108, 109**


Epiglottic cartilage
Hyoid bone
Thyrohyoid membrane
Superior horn of thyroid cartilage
Corniculate cartilage
Arytenoid cartilage
Superior thyroid notch
Lamina of thyroid cartilage
Vocal ligament
Median cricothyroid ligament
Inferior horn of thyroid cartilage
Cricoid cartilage
Trachea
Cricoid cartilage
Arytenoid articular surface
Lamina
Arch
Corniculate cartilage
Muscular process
Vocal process
Arytenoid cartilage

Anterior view

Posterior view

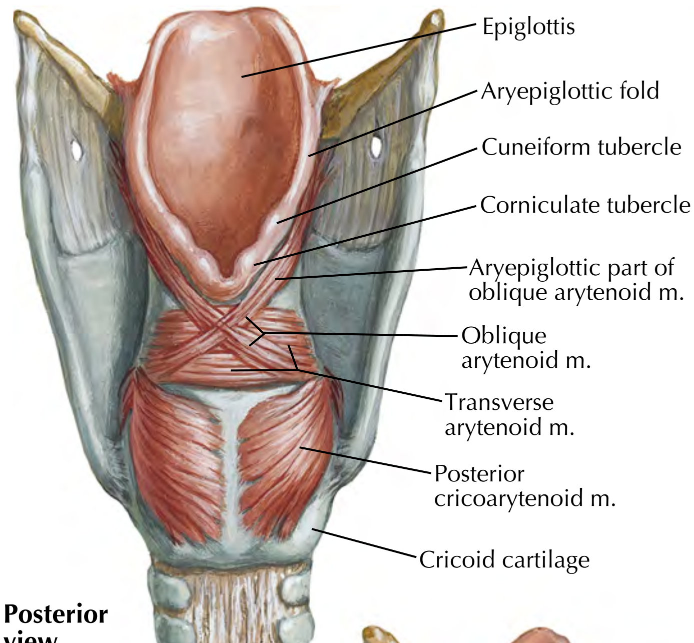
Anterosuperior view


Epiglottic cartilage
Hyoepiglottic ligament
Hyoid bone
Triticeal cartilage
Thyrohyoid membrane
Lamina of thyroid cartilage
Oblique line of thyroid cartilage
Laryngeal prominence
Corniculate cartilage
Arytenoid cartilage
Conus elasticus
Muscular process
Vocal process
Vocal ligament
Thyroepiglottic ligament
Median cricothyroid ligament
Cricoid cartilage
Cricothyroid joint
Trachea
Quadrangular membrane
Conus elasticus
F. Netter M.D.

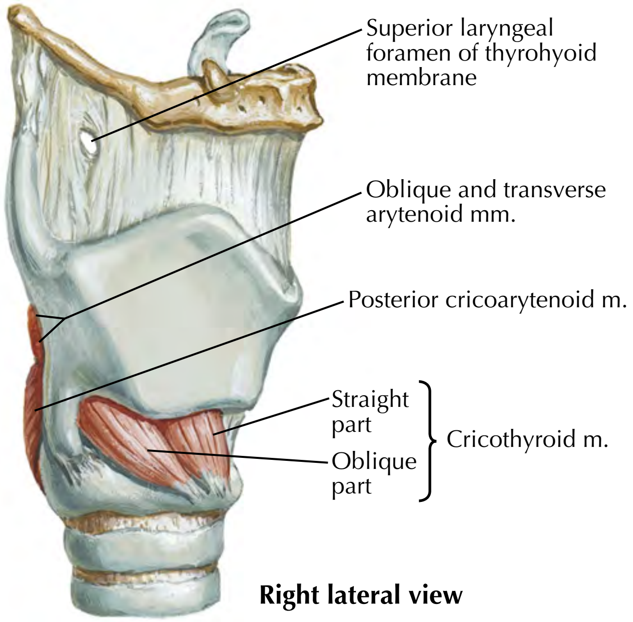
Right lateral view

Median section

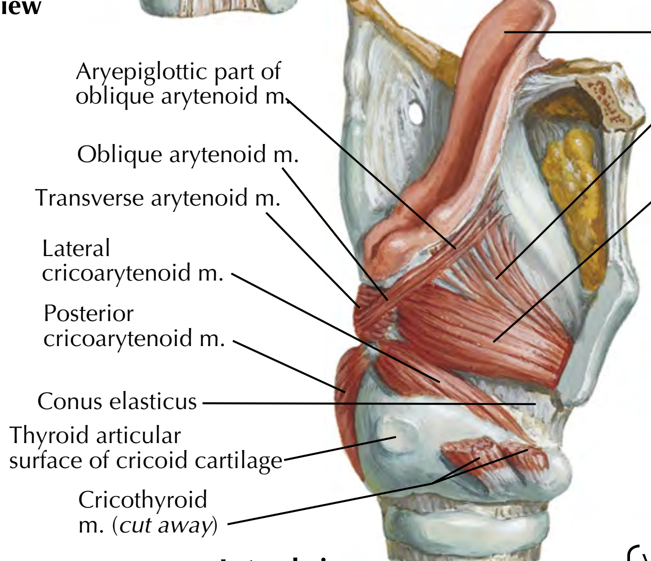
See also **Plates 94, 106, 108, 109**


Epiglottis
Aryepiglottic fold
Cuneiform tubercle
Corniculate tubercle
Aryepiglottic part of oblique arytenoid m.
Oblique arytenoid m.
Transverse arytenoid m.
Posterior cricoarytenoid m.
Cricoid cartilage

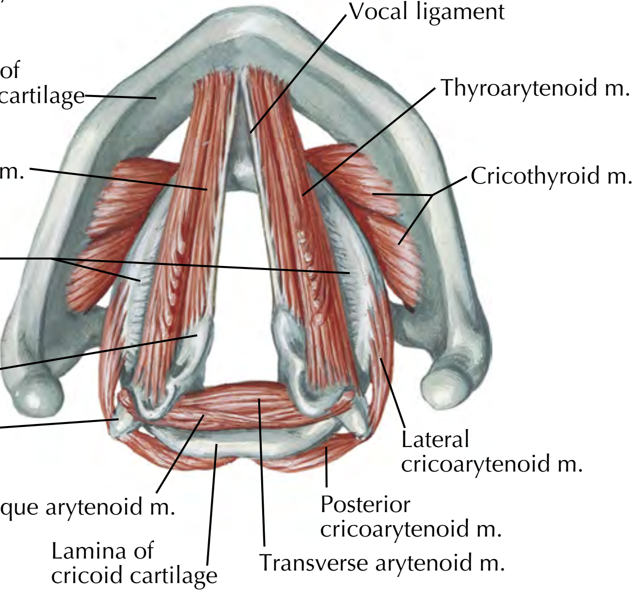
Posterior view


Superior laryngeal foramen of thyrohyoid membrane
Oblique and transverse arytenoid mm.
Posterior cricoarytenoid m.
Straight part
Oblique part
Cricothyroid m.

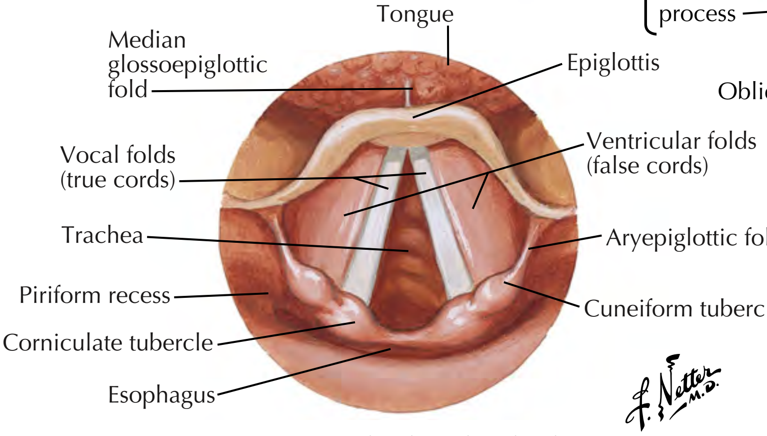
Right lateral view


Epiglottis
Aryepiglottic part of oblique arytenoid m.
Thyroepiglottic part of thyroarytenoid m.
Oblique arytenoid m.
External part of thyroarytenoid m.
Transverse arytenoid m.
Lateral cricoarytenoid m.
Posterior cricoarytenoid m.
Conus elasticus
Thyroid articular surface of cricoid cartilage
Cricothyroid m. (cut away)

Lateral view


Vocal ligament
Lamina of thyroid cartilage
Thyroarytenoid m.
Vocalis m.
Cricothyroid m.
Conus elasticus
Arytenoid cartilage
Vocal process
Muscular process
Lateral cricoarytenoid m.
Oblique arytenoid m.
Posterior cricoarytenoid m.
Lamina of cricoid cartilage
Transverse arytenoid m.

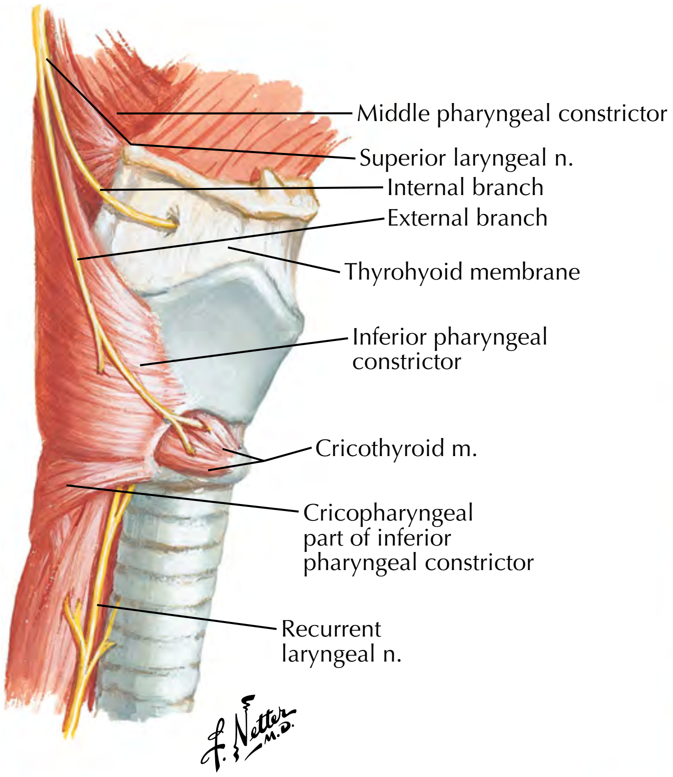
Superior view

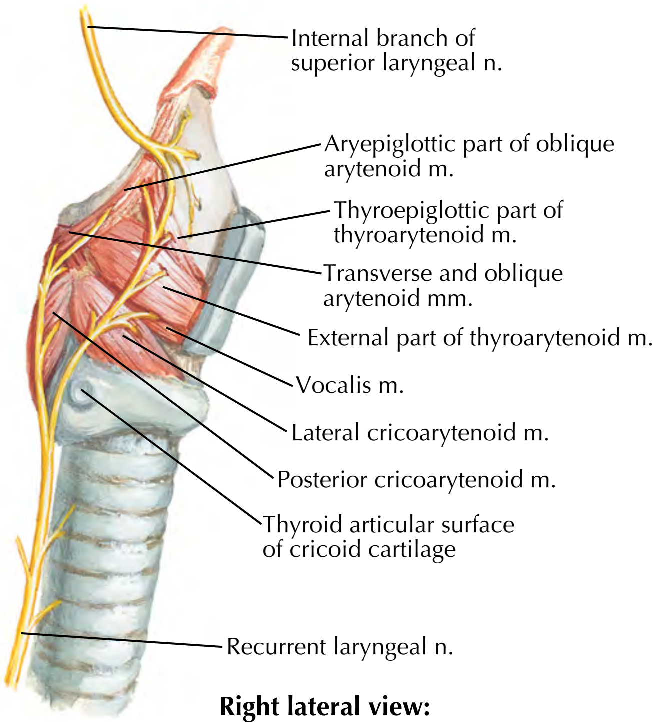

Tongue
Median glossoepiglottic fold
Epiglottis
Vocal folds (true cords)
Ventricular folds (false cords)
Trachea
Aryepiglottic fold
Piriform recess
Cuneiform tubercle
Corniculate tubercle
Esophagus

Laryngoscopic view: inspiration

Nerves and Coronal Section of Larynx

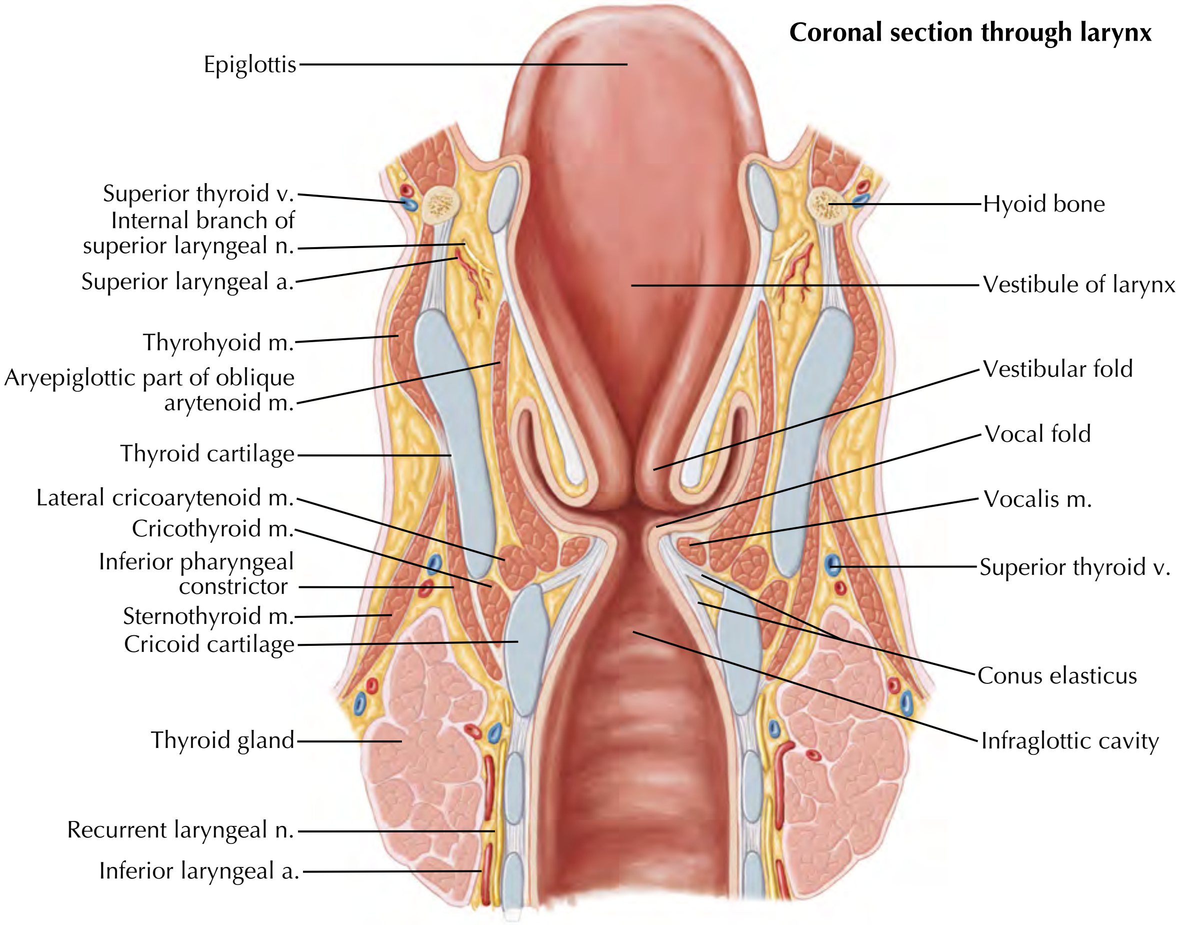
See also **Plates 103, 106, 107, 109**


Middle pharyngeal constrictor
Superior laryngeal n.
Internal branch
External branch
Thyrohyoid membrane
Inferior pharyngeal constrictor
Cricothyroid m.
Cricopharyngeal part of inferior pharyngeal constrictor
Recurrent laryngeal n.
F. Netter M.D.


Internal branch of superior laryngeal n.
Aryepiglottic part of oblique arytenoid m.
Thyroepiglottic part of thyroarytenoid m.
Transverse and oblique arytenoid mm.
External part of thyroarytenoid m.
Vocalis m.
Lateral cricoarytenoid m.
Posterior cricoarytenoid m.
Thyroid articular surface of cricoid cartilage
Recurrent laryngeal n.

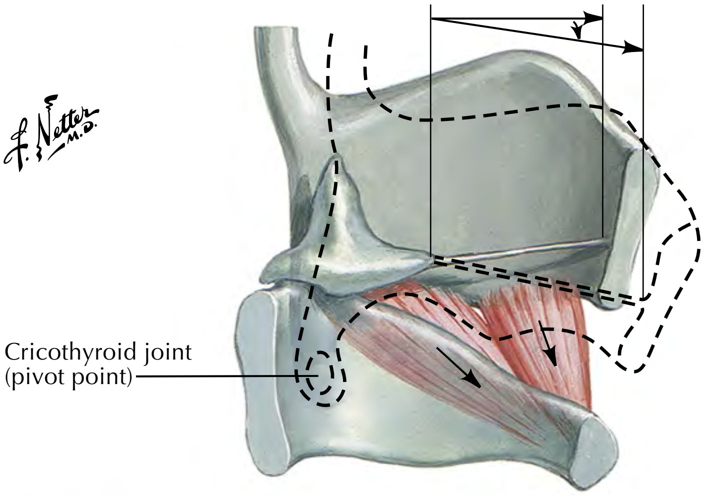
Right lateral view: thyroid cartilage partially removed

Coronal section through larynx

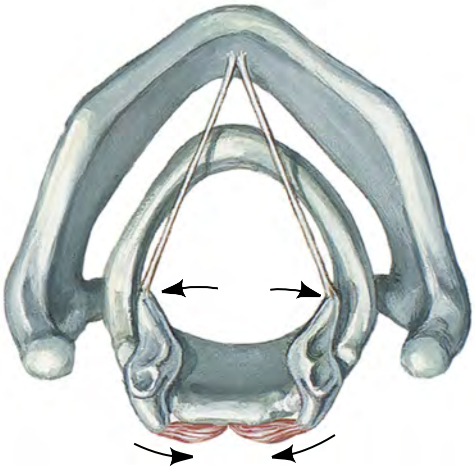

Epiglottis
Superior thyroid v.
Internal branch of superior laryngeal n.
Superior laryngeal a.
Thyrohyoid m.
Aryepiglottic part of oblique arytenoid m.
Thyroid cartilage
Lateral cricoarytenoid m.
Cricothyroid m.
Inferior pharyngeal constrictor
Sternothyroid m.
Cricoid cartilage
Thyroid gland
Recurrent laryngeal n.
Inferior laryngeal a.
Hyoid bone
Vestibule of larynx
Vestibular fold
Vocal fold
Vocalis m.
Superior thyroid v.
Conus elasticus
Infraglottic cavity

Action of Intrinsic Muscles of Larynx

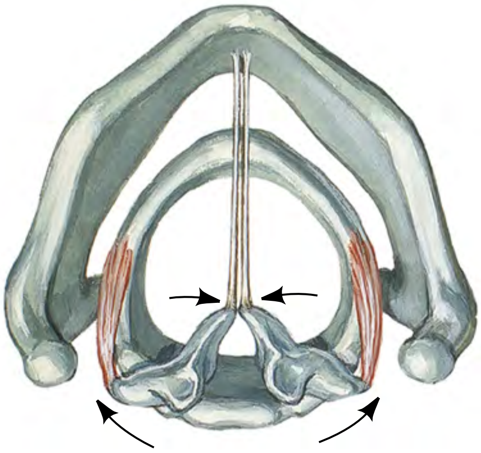
See also **Plates 106, 107, 108**



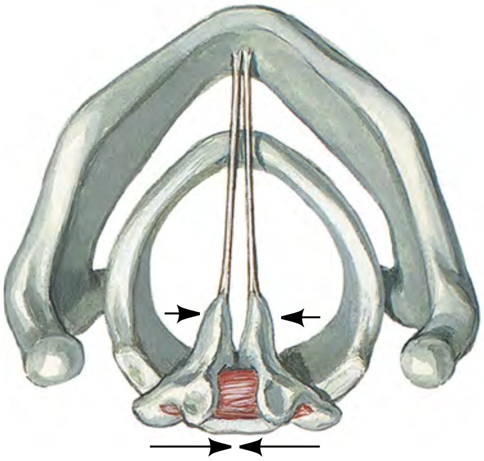
Action of cricothyroid muscles
Stretching of vocal ligaments



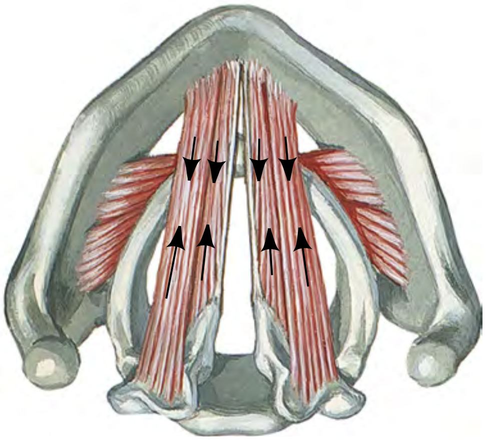
Action of posterior cricoarytenoid muscles
Abduction of vocal ligaments



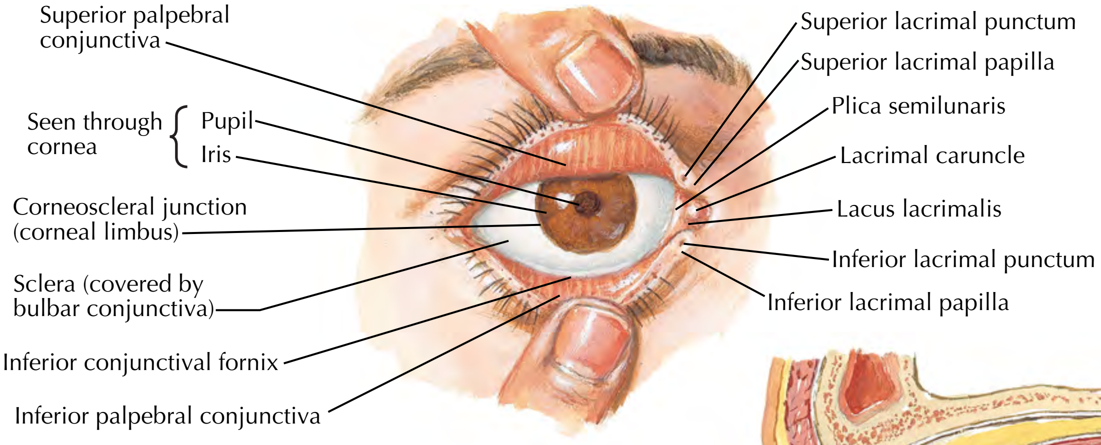
Action of lateral cricoarytenoid muscles
Adduction of vocal ligaments

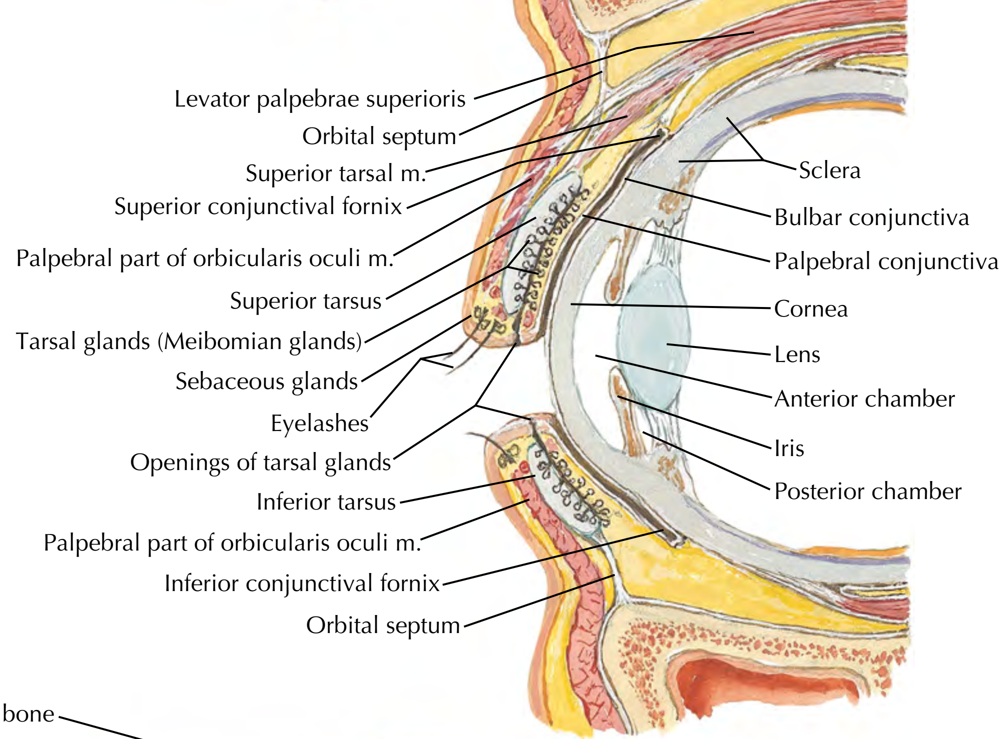


Action of transverse and oblique arytenoid muscles
Adduction of vocal ligaments

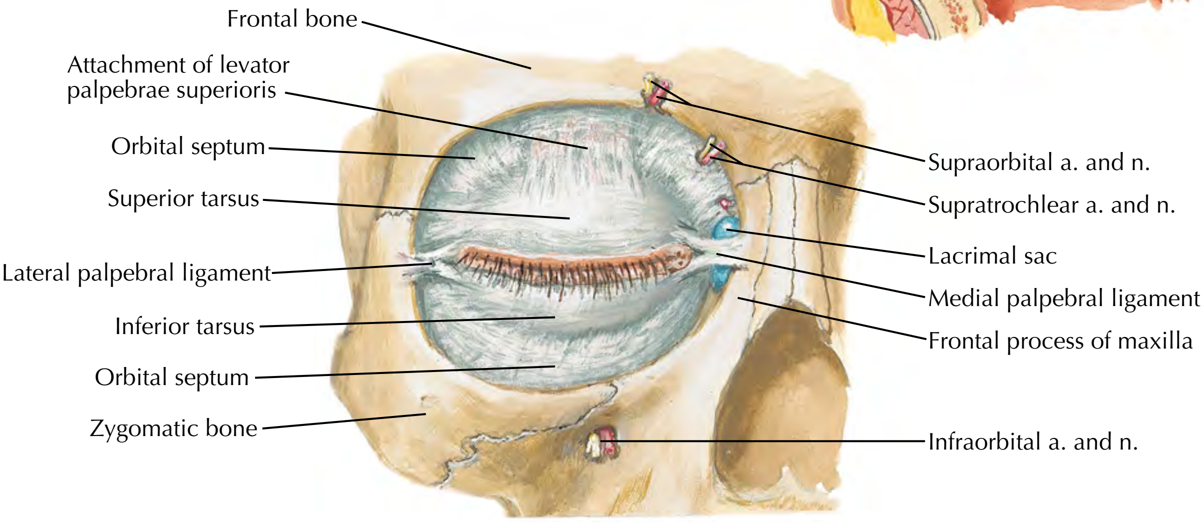


Action of vocalis and thyroarytenoid muscles
Shortening (relaxation) of vocal ligaments


Superior palpebral conjunctiva
Seen through cornea
Pupil
Iris
Corneoscleral junction (corneal limbus)
Sclera (covered by bulbar conjunctiva)
Inferior conjunctival fornix
Inferior palpebral conjunctiva
Superior lacrimal punctum
Superior lacrimal papilla
Plica semilunaris
Lacrimal caruncle
Lacus lacrimalis
Inferior lacrimal punctum
Inferior lacrimal papilla

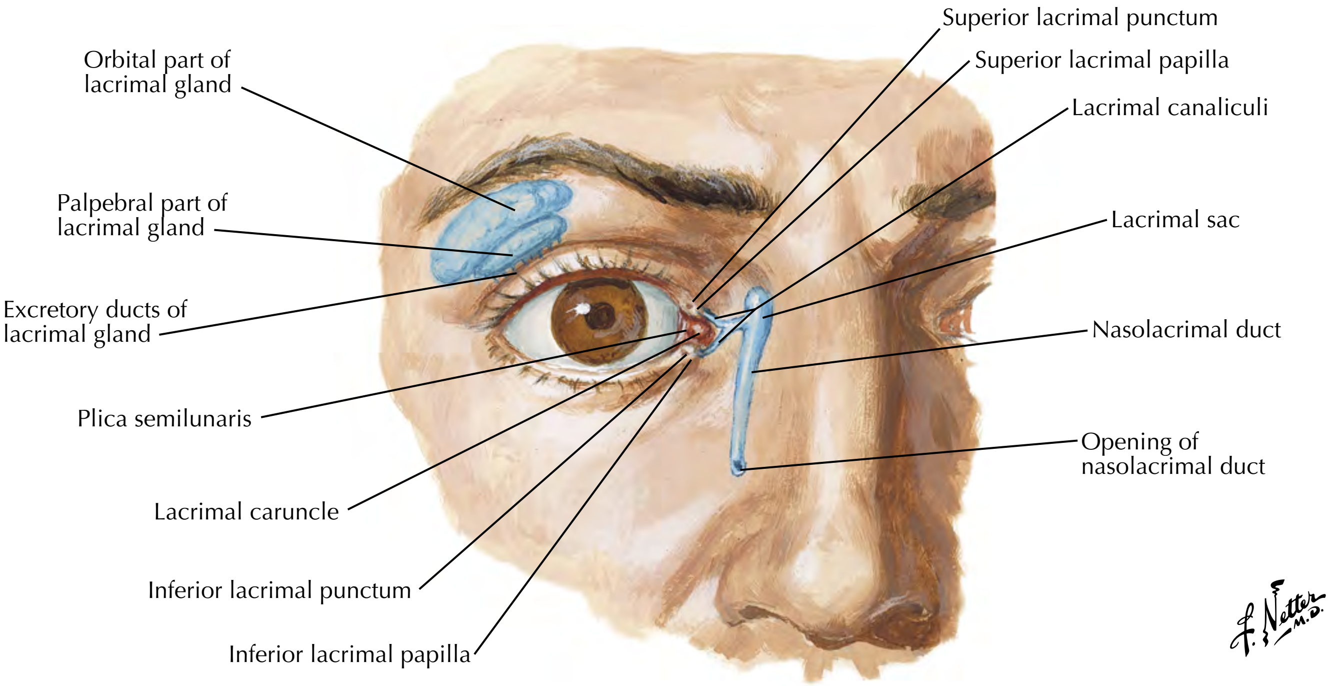

Levator palpebrae superioris
Orbital septum
Superior tarsal m.
Superior conjunctival fornix
Palpebral part of orbicularis oculi m.
Superior tarsus
Tarsal glands (Meibomian glands)
Sebaceous glands
Eyelashes
Openings of tarsal glands
Inferior tarsus
Palpebral part of orbicularis oculi m.
Inferior conjunctival fornix
Orbital septum
Sclera
Bulbar conjunctiva
Palpebral conjunctiva
Cornea
Lens
Anterior chamber
Iris
Posterior chamber

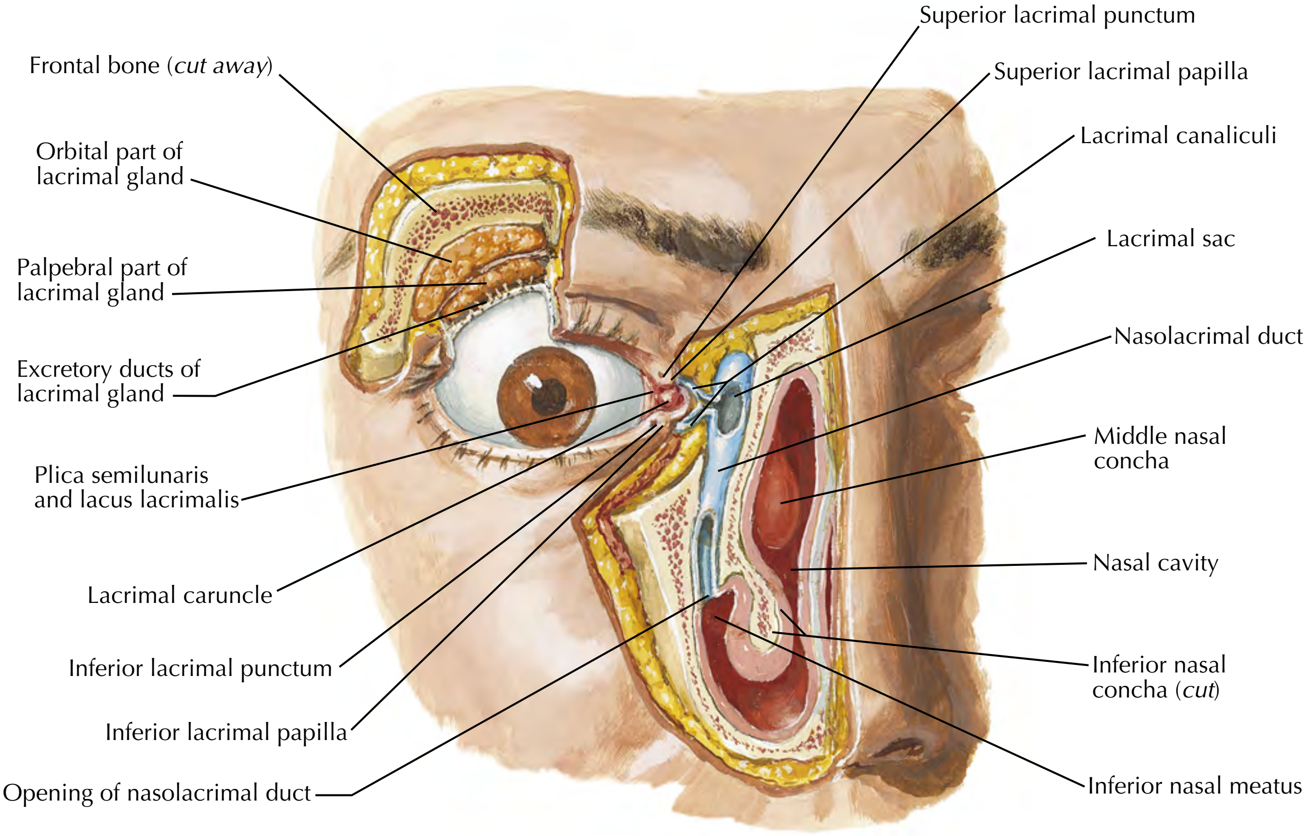
F. Netter M.D.


Frontal bone
Attachment of levator palpebrae superioris
Orbital septum
Superior tarsus
Lateral palpebral ligament
Inferior tarsus
Orbital septum
Zygomatic bone
Supraorbital a. and n.
Supratrochlear a. and n.
Lacrimal sac
Medial palpebral ligament
Frontal process of maxilla
Infraorbital a. and n.

Lacrimal Apparatus

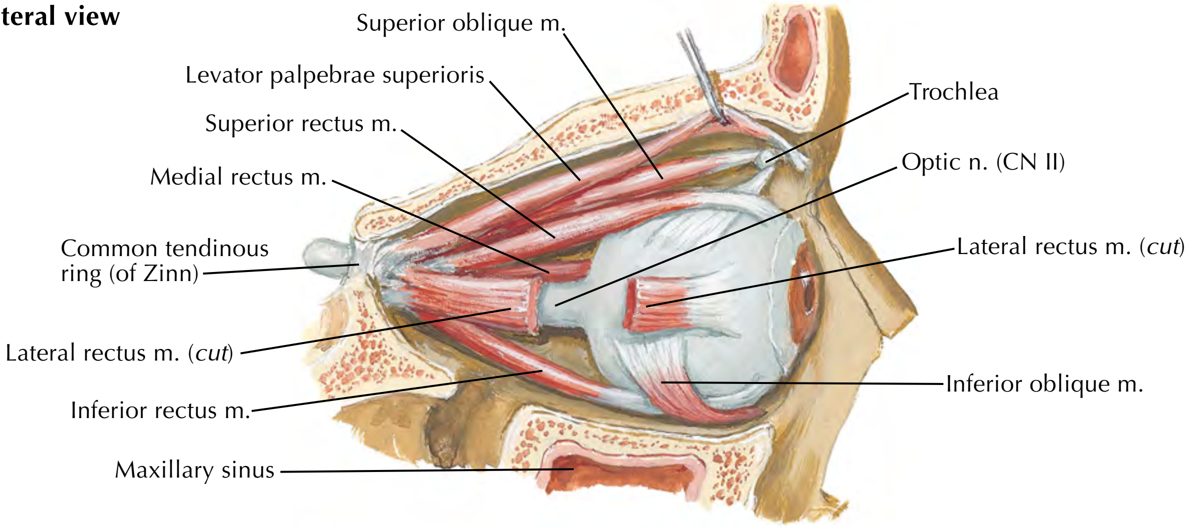
See also **Plates 61, 160**


Orbital part of lacrimal gland
Palpebral part of lacrimal gland
Excretory ducts of lacrimal gland
Plica semilunaris
Lacrimal caruncle
Inferior lacrimal punctum
Inferior lacrimal papilla
Superior lacrimal punctum
Superior lacrimal papilla
Lacrimal canaliculi
Lacrimal sac
Nasolacrimal duct
Opening of nasolacrimal duct

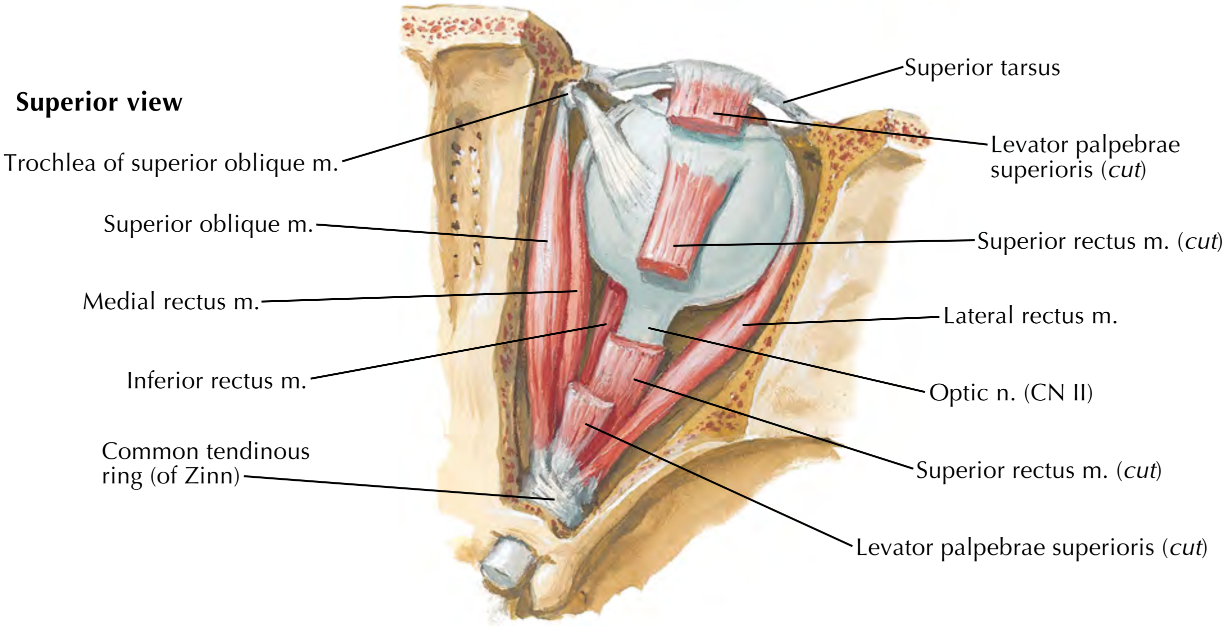

Frontal bone (*cut away*)
Orbital part of lacrimal gland
Palpebral part of lacrimal gland
Excretory ducts of lacrimal gland
Plica semilunaris and lacus lacrimalis
Lacrimal caruncle
Inferior lacrimal punctum
Inferior lacrimal papilla
Opening of nasolacrimal duct
Superior lacrimal punctum
Superior lacrimal papilla
Lacrimal canaliculi
Lacrimal sac
Nasolacrimal duct
Middle nasal concha
Nasal cavity
Inferior nasal concha (*cut*)
Inferior nasal meatus

See also **Plates 113, BP 27**

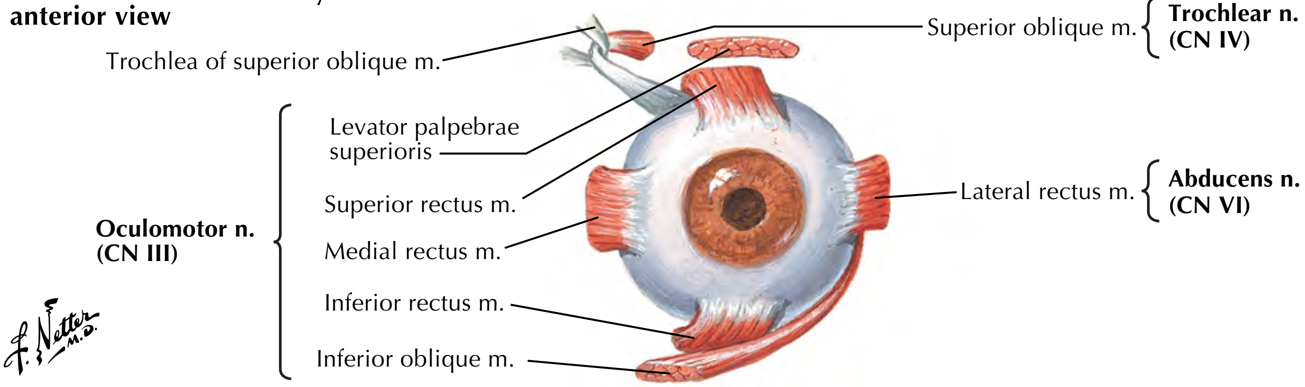
Right lateral view


Superior oblique m.
Levator palpebrae superioris
Superior rectus m.
Medial rectus m.
Common tendinous ring (of Zinn)
Lateral rectus m. (*cut*)
Inferior rectus m.
Maxillary sinus
Trochlea
Optic n. (CN II)
Lateral rectus m. (*cut*)
Inferior oblique m.

Superior view


Trochlea of superior oblique m.
Superior oblique m.
Medial rectus m.
Inferior rectus m.
Common tendinous ring (of Zinn)
Superior tarsus
Levator palpebrae superioris (*cut*)
Superior rectus m. (*cut*)
Lateral rectus m.
Optic n. (CN II)
Superior rectus m. (*cut*)
Levator palpebrae superioris (*cut*)

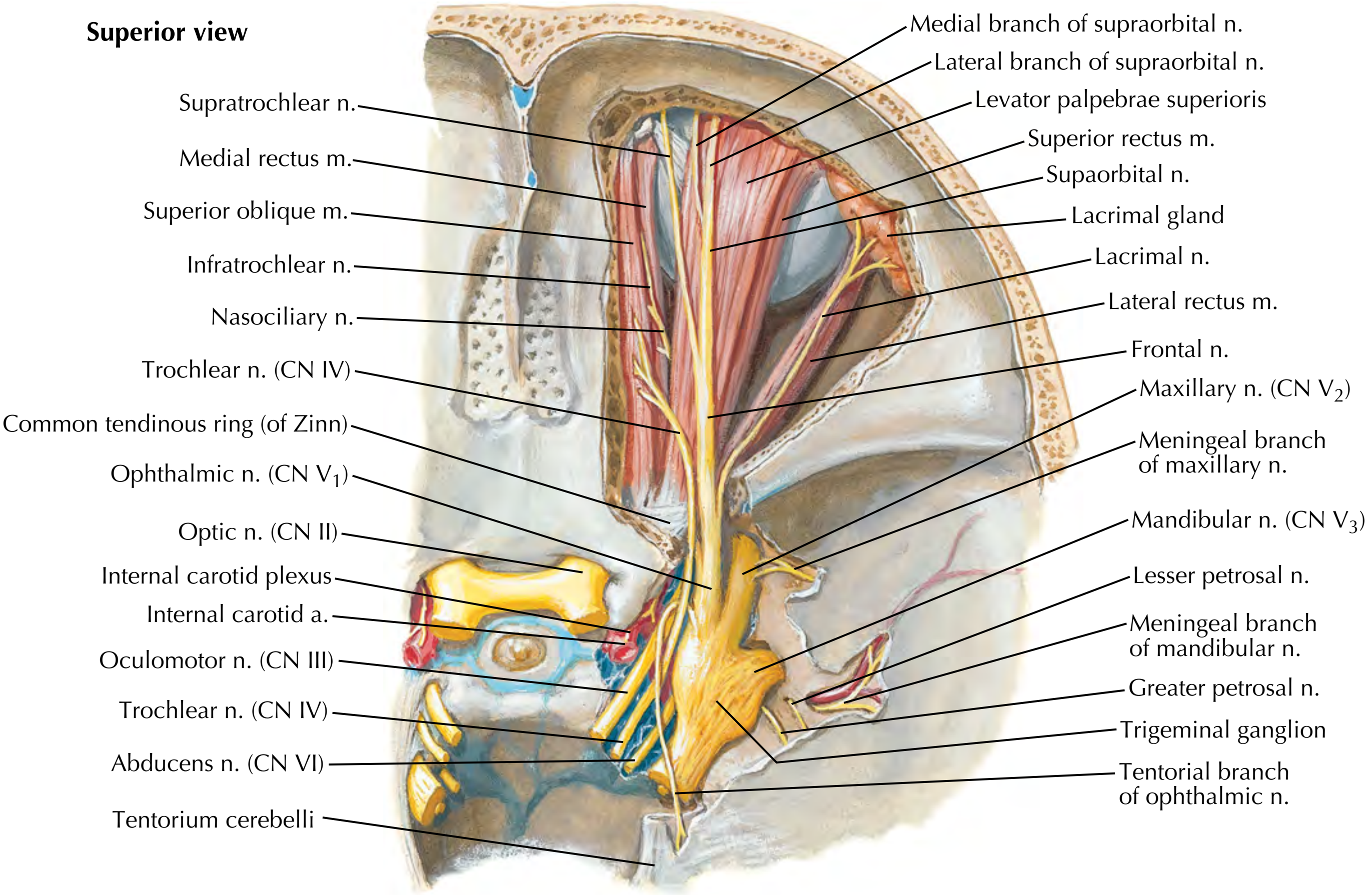
Innervation of extrinsic eye muscles: anterior view


Trochlea of superior oblique m.
Superior oblique m. { **Trochlear n. (CN IV)**
Levator palpebrae superioris
Superior rectus m.
Medial rectus m.
Inferior rectus m.
Inferior oblique m.
Oculomotor n. (CN III)
Lateral rectus m. { **Abducens n. (CN VI)**
F. Netter M.D.

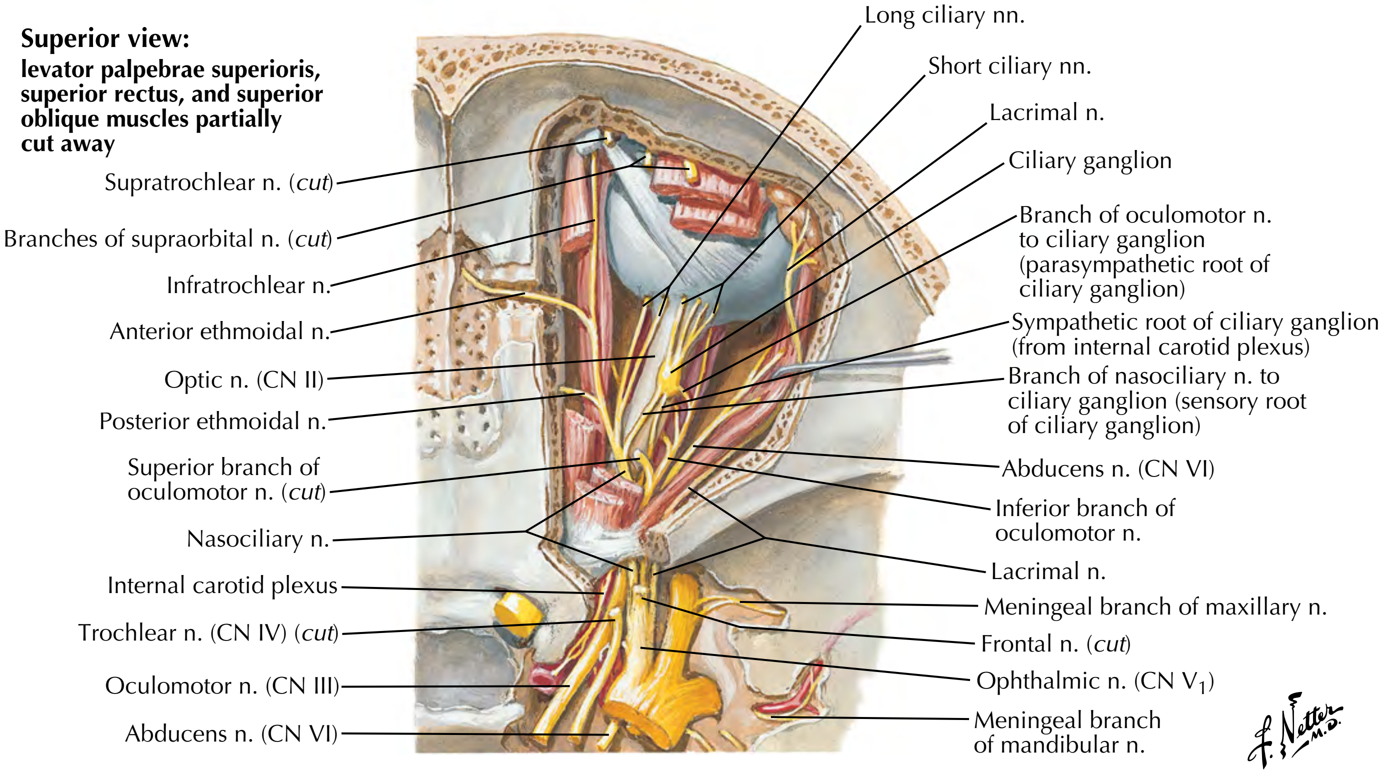
Nerves of Orbit

See also **Plates 79, 148, 149, BP 27**

Superior view

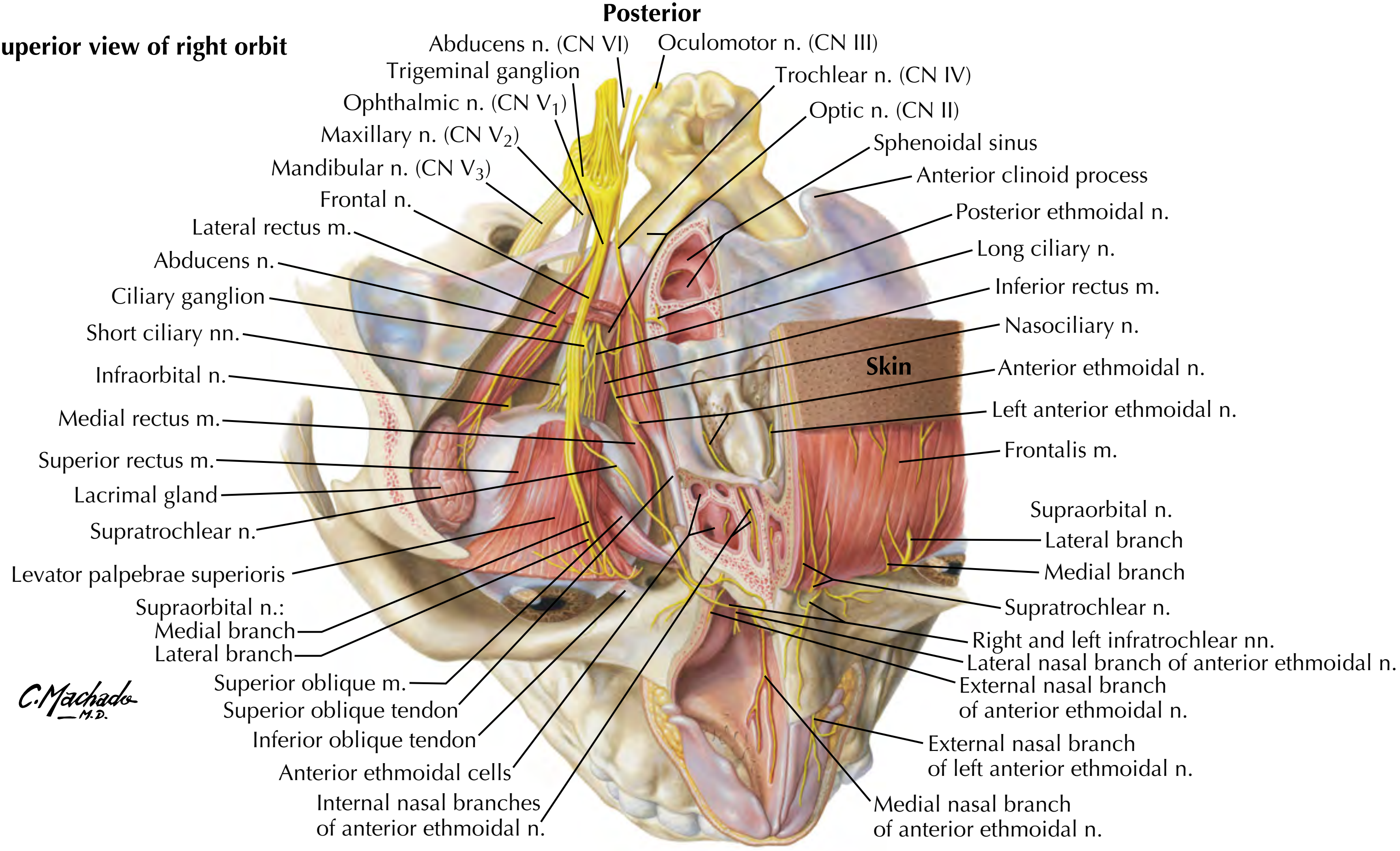

Supratrochlear n.
Medial rectus m.
Superior oblique m.
Infratrochlear n.
Nasociliary n.
Trochlear n. (CN IV)
Common tendinous ring (of Zinn)
Ophthalmic n. (CN V_1)
Optic n. (CN II)
Internal carotid plexus
Internal carotid a.
Oculomotor n. (CN III)
Trochlear n. (CN IV)
Abducens n. (CN VI)
Tentorium cerebelli
Medial branch of supraorbital n.
Lateral branch of supraorbital n.
Levator palpebrae superioris
Superior rectus m.
Supaorbital n.
Lacrimal gland
Lacrimal n.
Lateral rectus m.
Frontal n.
Maxillary n. (CN V_2)
Meningeal branch of maxillary n.
Mandibular n. (CN V_3)
Lesser petrosal n.
Meningeal branch of mandibular n.
Greater petrosal n.
Trigeminal ganglion
Tentorial branch of ophthalmic n.

Superior view:
levator palpebrae superioris, superior rectus, and superior oblique muscles partially cut away

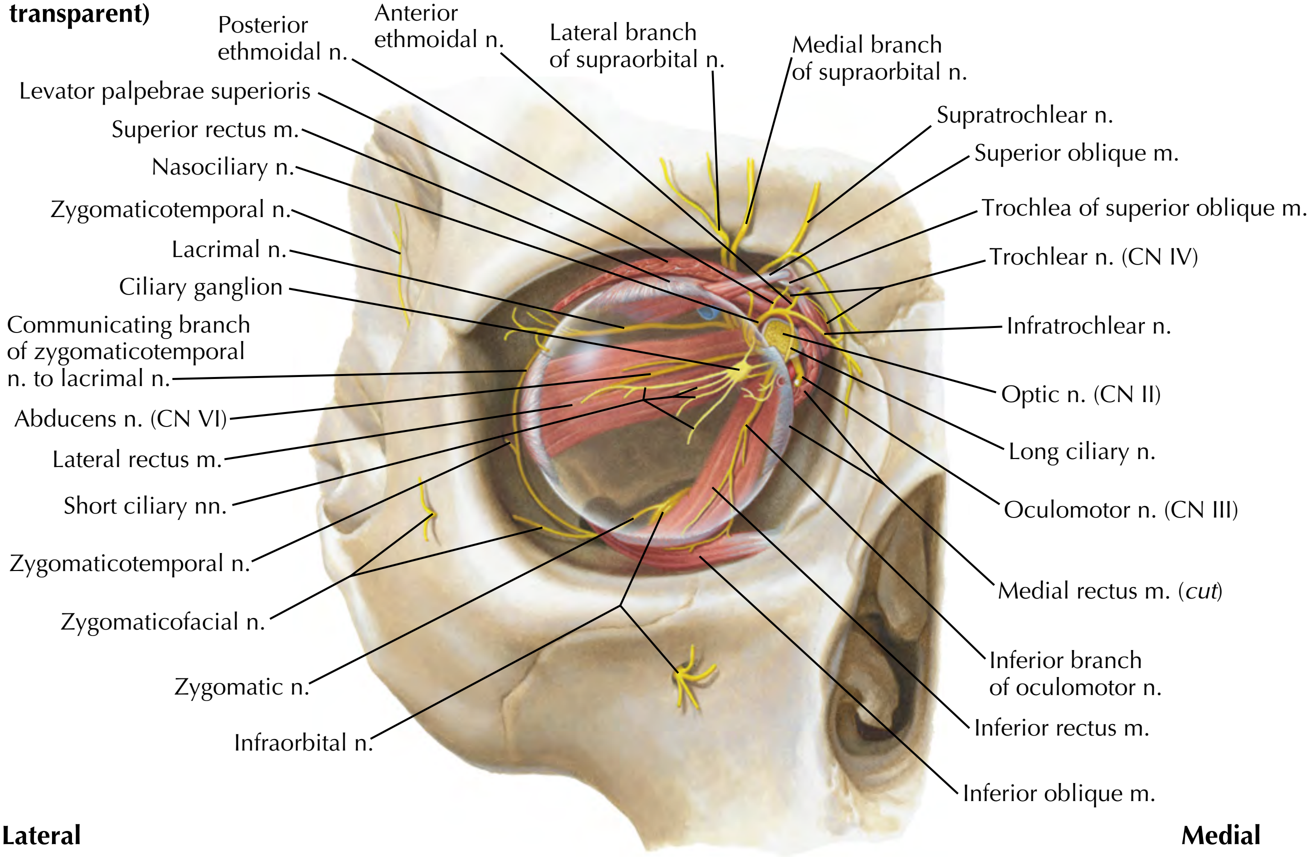

Supratrochlear n. (*cut*)
Branches of supraorbital n. (*cut*)
Infratrochlear n.
Anterior ethmoidal n.
Optic n. (CN II)
Posterior ethmoidal n.
Superior branch of oculomotor n. (*cut*)
Nasociliary n.
Internal carotid plexus
Trochlear n. (CN IV) (*cut*)
Oculomotor n. (CN III)
Abducens n. (CN VI)
Long ciliary nn.
Short ciliary nn.
Lacrimal n.
Ciliary ganglion
Branch of oculomotor n. to ciliary ganglion (parasympathetic root of ciliary ganglion)
Sympathetic root of ciliary ganglion (from internal carotid plexus)
Branch of nasociliary n. to ciliary ganglion (sensory root of ciliary ganglion)
Abducens n. (CN VI)
Inferior branch of oculomotor n.
Lacrimal n.
Meningeal branch of maxillary n.
Frontal n. (*cut*)
Ophthalmic n. (CN V_1)
Meningeal branch of mandibular n.

See also **Plates 112, 113, BP 27**

Superior view of right orbit


Posterior
Abducens n. (CN VI)
Oculomotor n. (CN III)
Trigeminal ganglion
Trochlear n. (CN IV)
Ophthalmic n. (CN V_1)
Optic n. (CN II)
Maxillary n. (CN V_2)
Sphenoidal sinus
Mandibular n. (CN V_3)
Anterior clinoid process
Frontal n.
Posterior ethmoidal n.
Lateral rectus m.
Long ciliary n.
Abducens n.
Inferior rectus m.
Ciliary ganglion
Nasociliary n.
Short ciliary nn.
Skin
Anterior ethmoidal n.
Infraorbital n.
Left anterior ethmoidal n.
Medial rectus m.
Frontalis m.
Superior rectus m.
Lacrimal gland
Supraorbital n.
Lateral branch
Supratrochlear n.
Medial branch
Levator palpebrae superioris
Supratrochlear n.
Supraorbital n.:
Medial branch
Lateral branch
Right and left infratrochlear nn.
Lateral nasal branch of anterior ethmoidal n.
C.Machado M.D.
Superior oblique m.
External nasal branch of anterior ethmoidal n.
Superior oblique tendon
Inferior oblique tendon
External nasal branch of left anterior ethmoidal n.
Anterior ethmoidal cells
Internal nasal branches of anterior ethmoidal n.
Medial nasal branch of anterior ethmoidal n.
Anterior

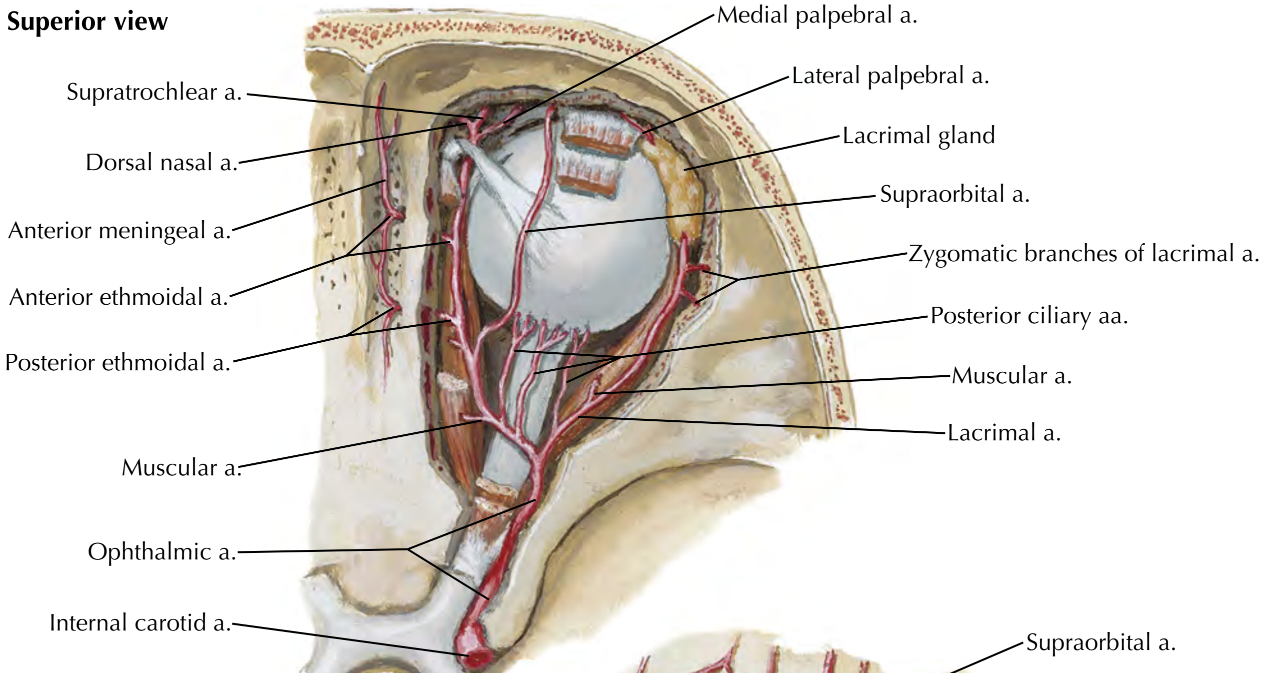
Anterior view of right orbit (eyeball transparent)


Posterior ethmoidal n.
Anterior ethmoidal n.
Lateral branch of supraorbital n.
Medial branch of supraorbital n.
Levator palpebrae superioris
Supratrochlear n.
Superior rectus m.
Superior oblique m.
Nasociliary n.
Trochlea of superior oblique m.
Zygomaticotemporal n.
Lacrimal n.
Trochlear n. (CN IV)
Ciliary ganglion
Infratrochlear n.
Communicating branch of zygomaticotemporal n. to lacrimal n.
Optic n. (CN II)
Abducens n. (CN VI)
Lateral rectus m.
Long ciliary n.
Short ciliary nn.
Oculomotor n. (CN III)
Zygomaticotemporal n.
Medial rectus m. (*cut*)
Zygomaticofacial n.
Inferior branch of oculomotor n.
Zygomatic n.
Inferior rectus m.
Infraorbital n.
Inferior oblique m.
Lateral
Medial

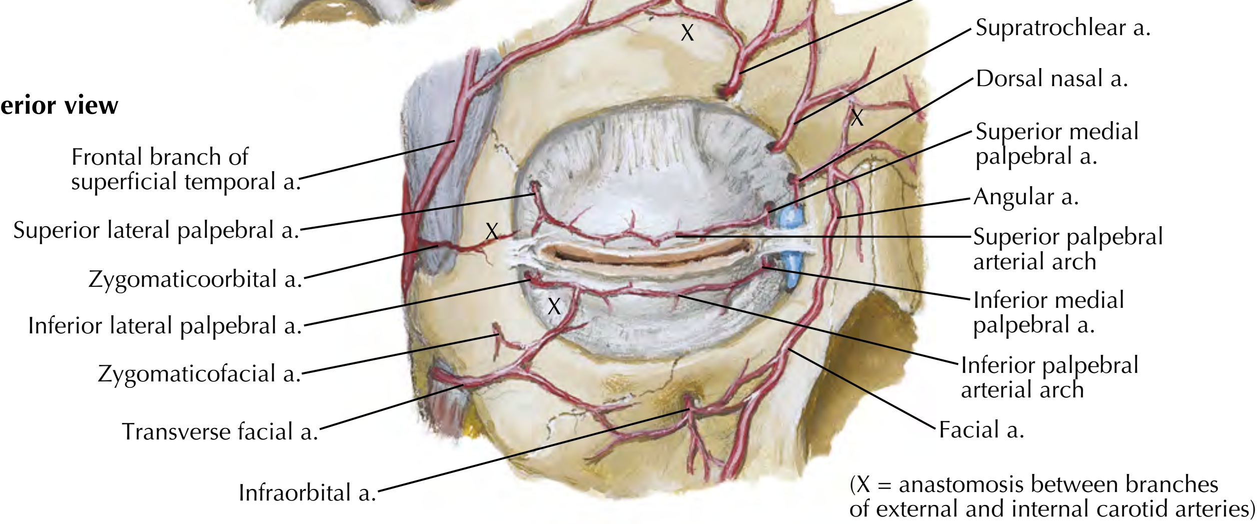
Arteries and Veins of Orbit and Eyelids

See also **Plates 24, 100, 110**

Superior view

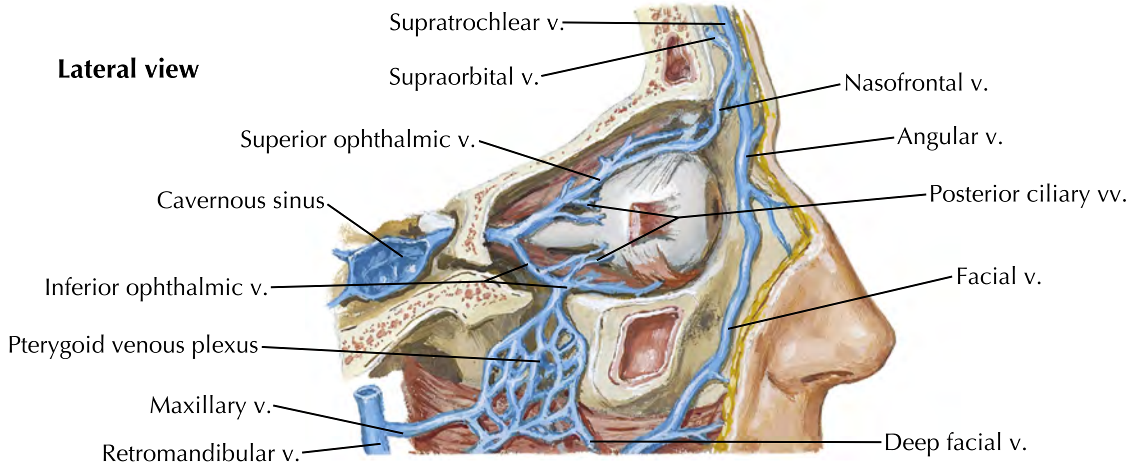

Medial palpebral a.
Supratrochlear a.
Lateral palpebral a.
Lacrimal gland
Dorsal nasal a.
Supraorbital a.
Anterior meningeal a.
Zygomatic branches of lacrimal a.
Anterior ethmoidal a.
Posterior ciliary aa.
Posterior ethmoidal a.
Muscular a.
Lacrimal a.
Muscular a.
Ophthalmic a.
Internal carotid a.

Anterior view


Supraorbital a.
X
Supratrochlear a.
Dorsal nasal a.
X
Frontal branch of superficial temporal a.
Superior medial palpebral a.
Angular a.
Superior lateral palpebral a.
X
Superior palpebral arterial arch
Zygomaticoorbital a.
Inferior medial palpebral a.
Inferior lateral palpebral a.
X
Inferior palpebral arterial arch
Zygomaticofacial a.
Transverse facial a.
Facial a.
Infraorbital a.

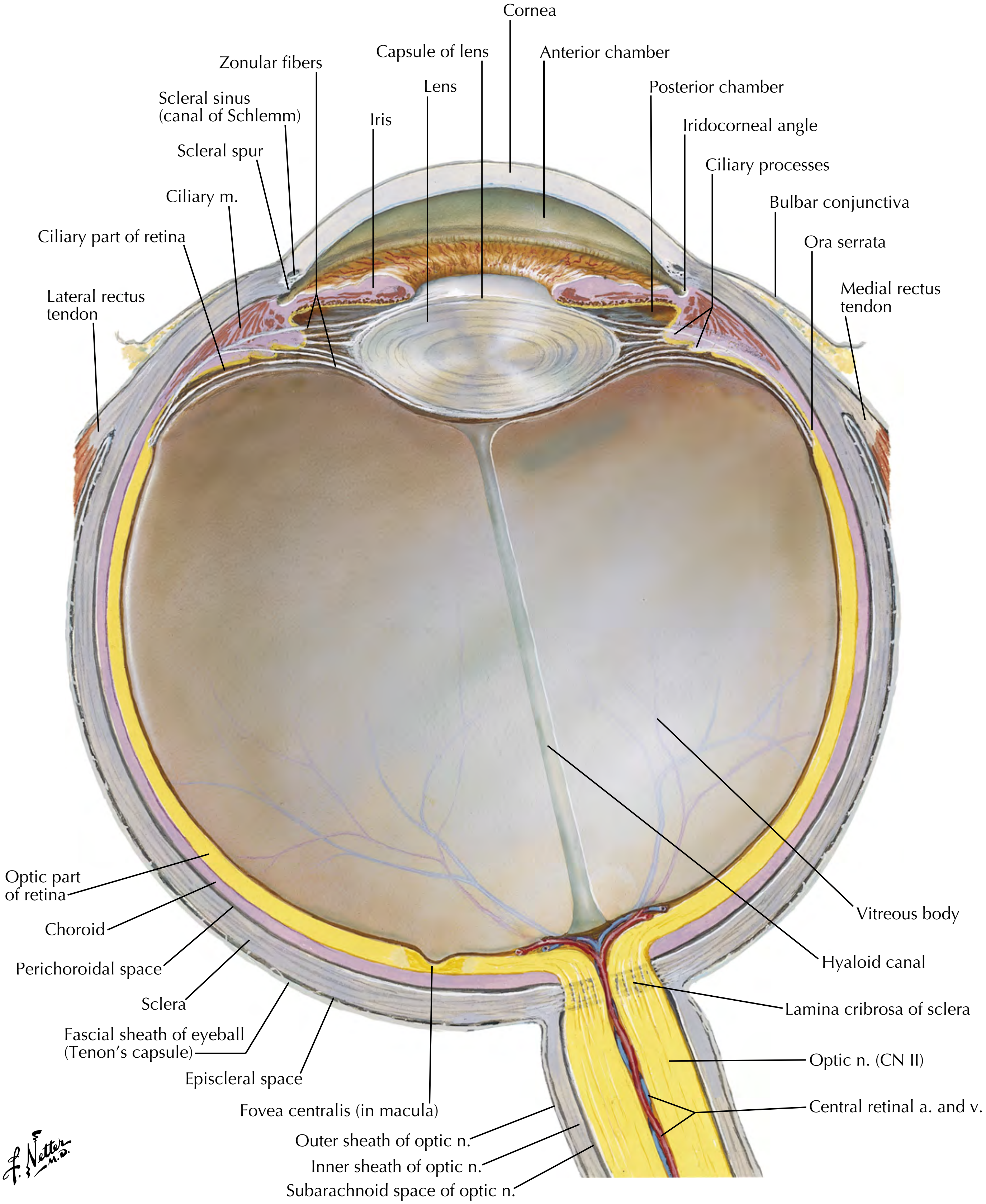
(X = anastomosis between branches of external and internal carotid arteries)

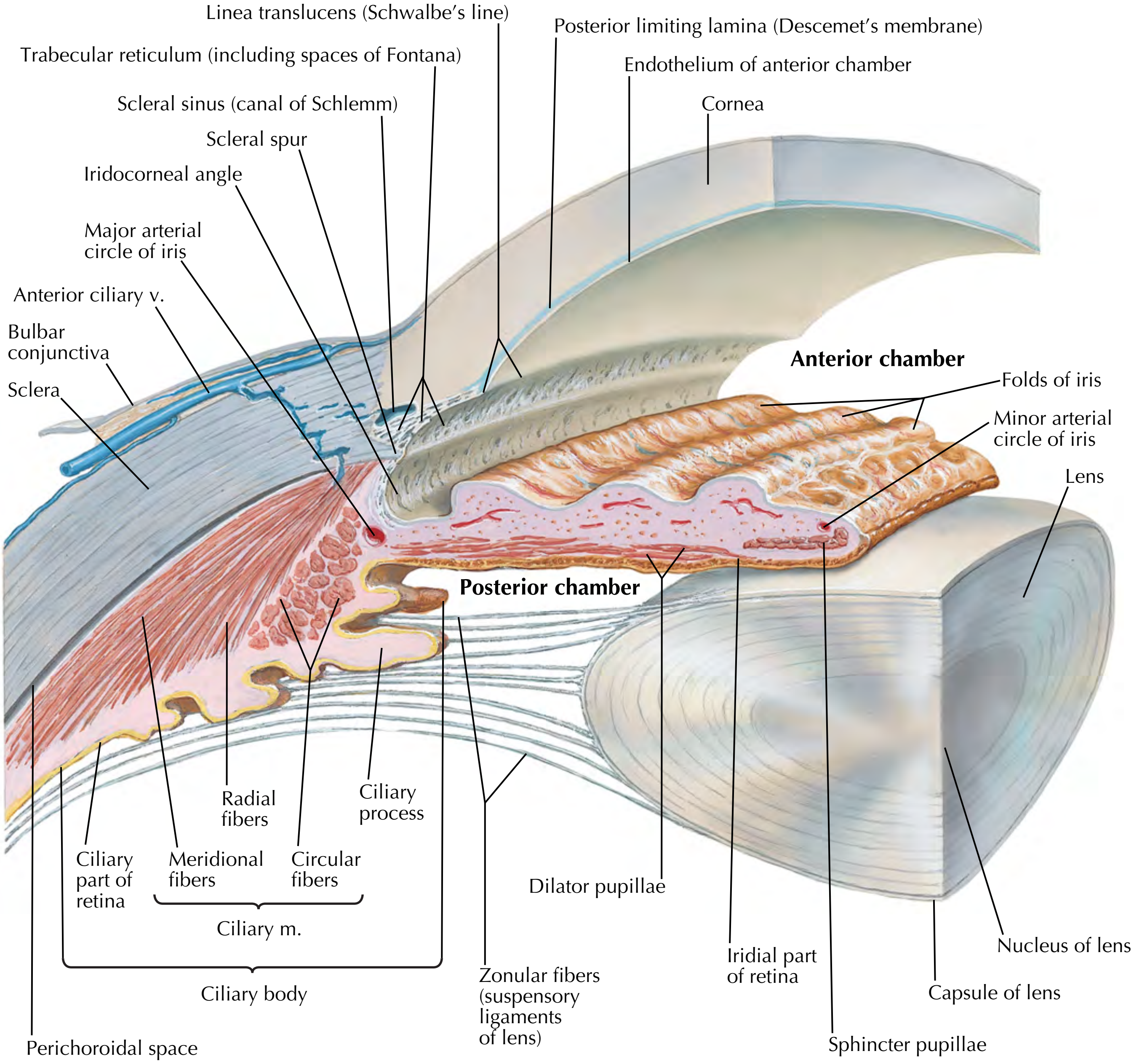
Lateral view


Supratrochlear v.
Supraorbital v.
Nasofrontal v.
Superior ophthalmic v.
Angular v.
Cavernous sinus
Posterior ciliary vv.
Inferior ophthalmic v.
Facial v.
Pterygoid venous plexus
Maxillary v.
Retromandibular v.
Deep facial v.

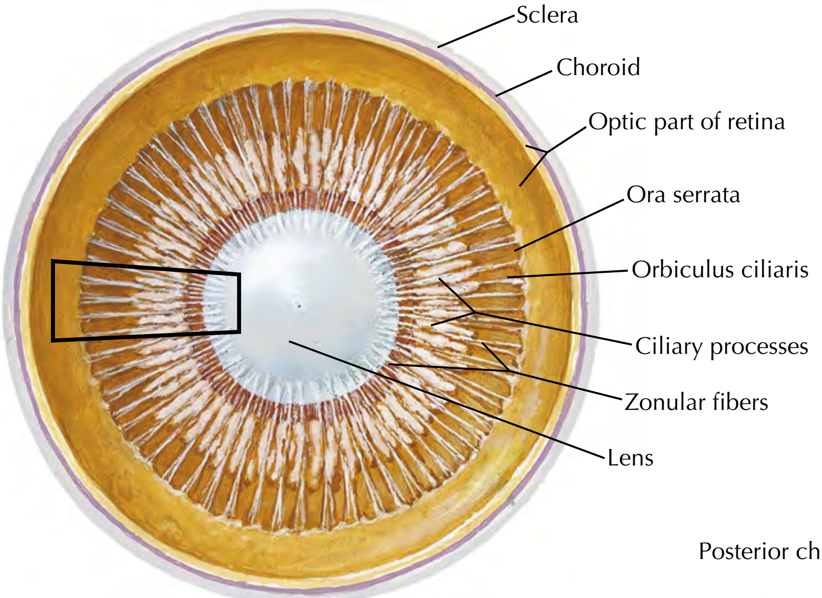
Eyeball: Transverse Section

See also **Plates 117, 118**

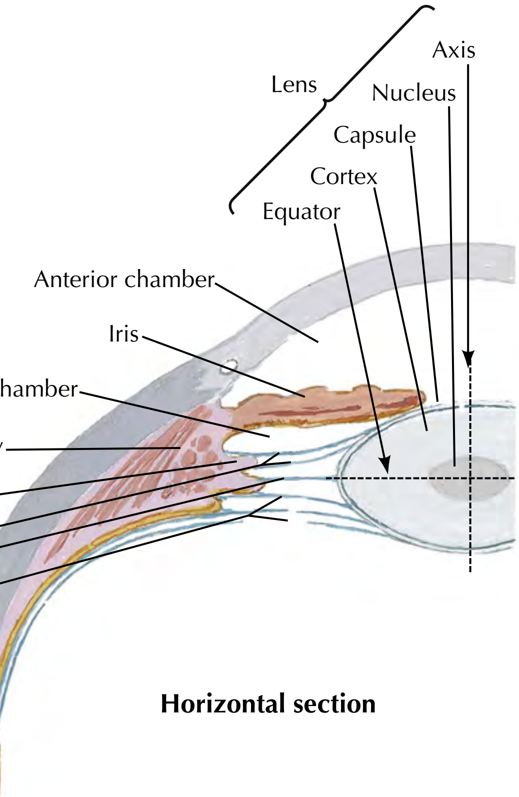

Cornea
Capsule of lens
Anterior chamber
Zonular fibers
Lens
Posterior chamber
Scleral sinus
(canal of Schlemm)
Iris
Iridocorneal angle
Scleral spur
Ciliary processes
Ciliary m.
Bulbar conjunctiva
Ciliary part of retina
Ora serrata
Lateral rectus
tendon
Medial rectus
tendon
Optic part
of retina
Choroid
Perichoroidal space
Sclera
Fascial sheath of eyeball
(Tenon's capsule)
Episcleral space
Fovea centralis (in macula)
Outer sheath of optic n.
Inner sheath of optic n.
Subarachnoid space of optic n.
Vitreous body
Hyaloid canal
Lamina cribrosa of sclera
Optic n. (CN II)
Central retinal a. and v.
F. Netter M.D.


Linea translucens (Schwalbe's line)
Trabecular reticulum (including spaces of Fontana)
Scleral sinus (canal of Schlemm)
Scleral spur
Iridocorneal angle
Major arterial circle of iris
Anterior ciliary v.
Bulbar conjunctiva
Sclera
Posterior limiting lamina (Descemet's membrane)
Endothelium of anterior chamber
Cornea
Anterior chamber
Folds of iris
Minor arterial circle of iris
Lens
Posterior chamber
Radial fibers
Ciliary process
Ciliary part of retina
Meridional fibers
Circular fibers
Ciliary m.
Ciliary body
Perichoroidal space
Dilator pupillae
Zonular fibers (suspensory ligaments of lens)
Iridial part of retina
Sphincter pupillae
Capsule of lens
Nucleus of lens

Note: For clarity, only single plane of zonular fibers shown; actually, fibers surround entire circumference of lens.

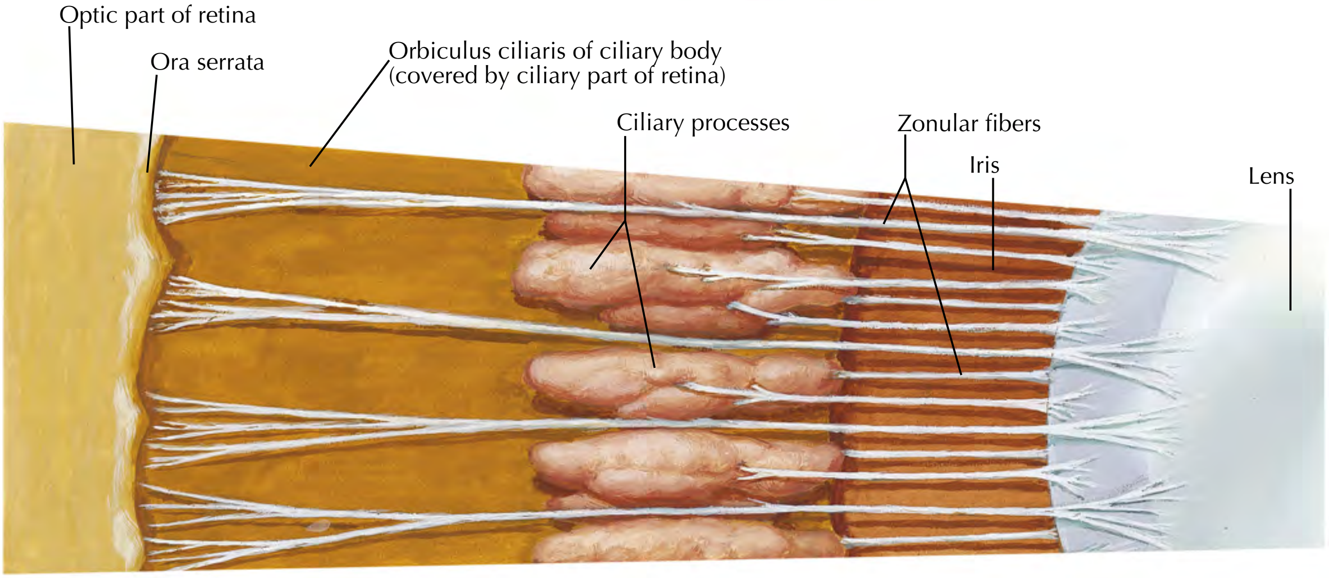

Sclera
Choroid
Optic part of retina
Ora serrata
Orbiculus ciliaris
Ciliary processes
Zonular fibers
Lens

Eyeball sectioned in coronal plane: anterior segment viewed from behind


Lens
Axis
Nucleus
Capsule
Cortex
Equator
Anterior chamber
Iris
Posterior chamber
Ciliary body
Ciliary process
Preequatorial zonular fibers
Equatorial zonular fibers
Postequatorial zonular fibers
Orbiculus ciliaris
Ora serrata
Optic part of retina

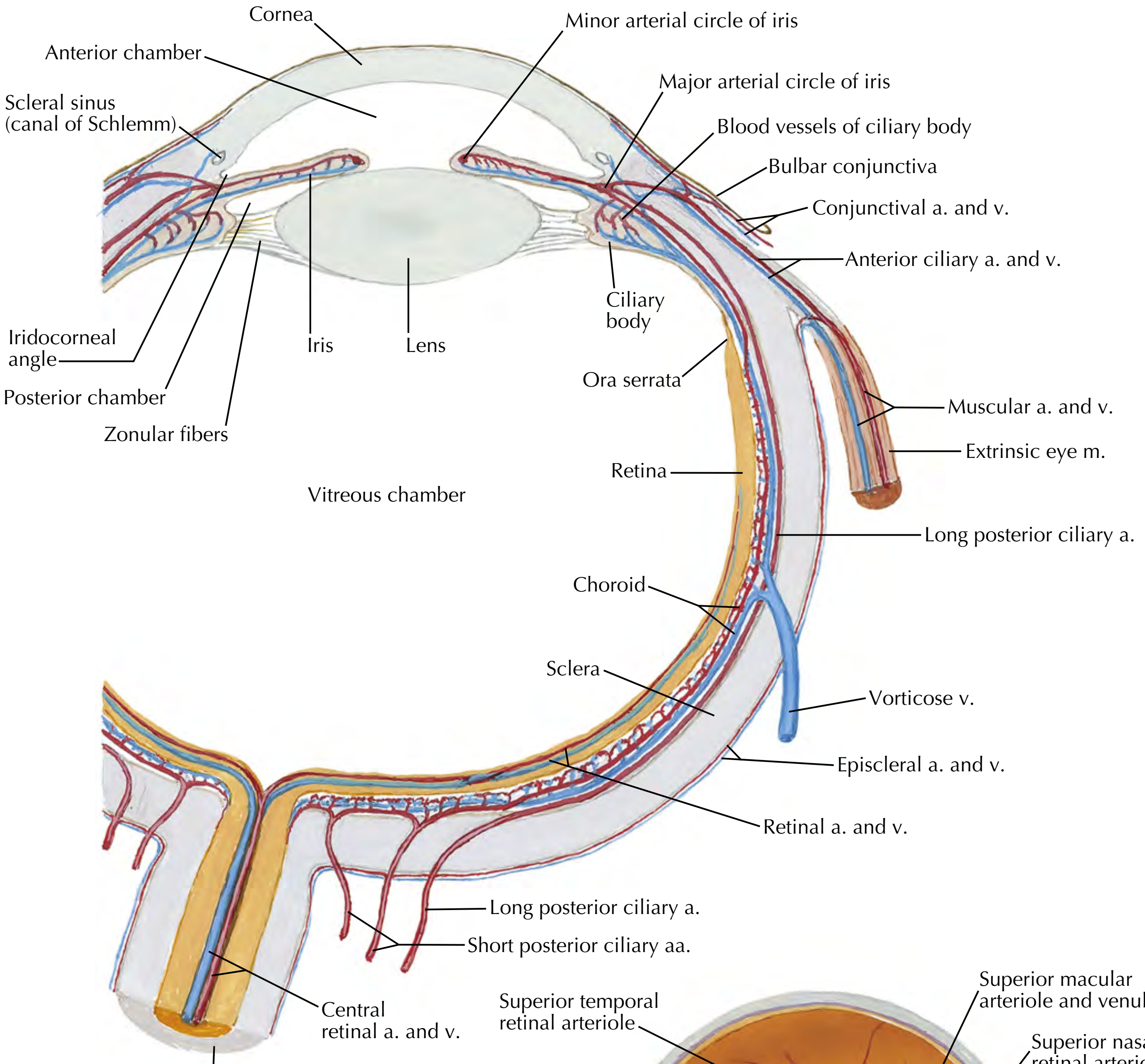
Horizontal section

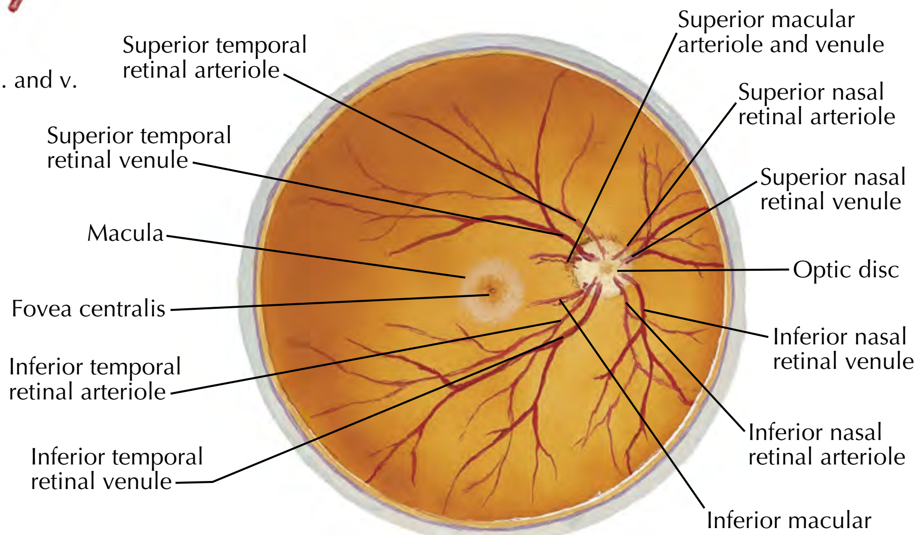
F. Netter M.D.


Optic part of retina
Ora serrata
Orbiculus ciliaris of ciliary body (covered by ciliary part of retina)
Ciliary processes
Zonular fibers
Iris
Lens

Enlargement of segment outlined in top illustration (semischematic)

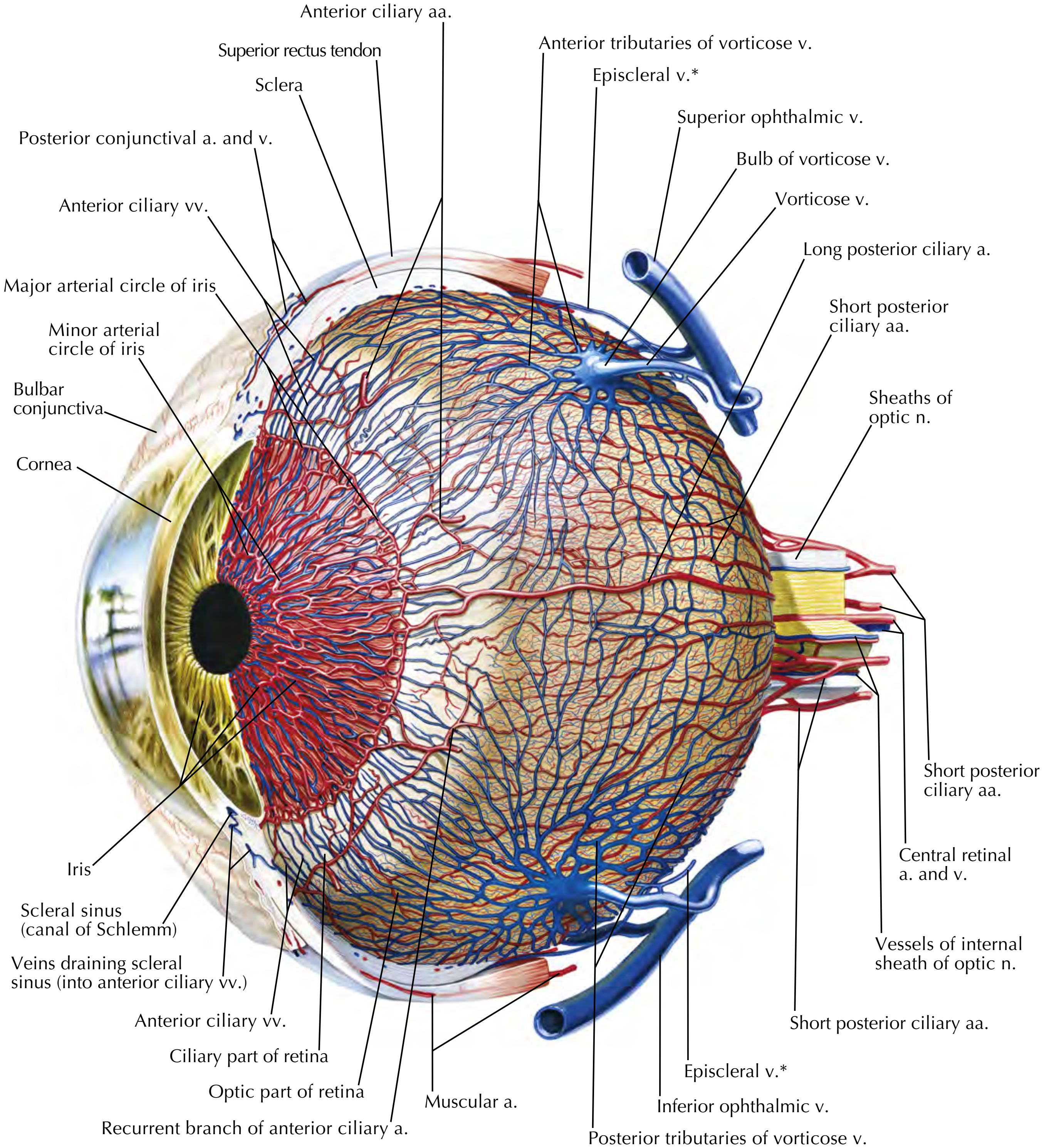
See also **Plate 120**


Cornea
Anterior chamber
Scleral sinus (canal of Schlemm)
Minor arterial circle of iris
Major arterial circle of iris
Blood vessels of ciliary body
Bulbar conjunctiva
Conjunctival a. and v.
Anterior ciliary a. and v.
Iridocorneal angle
Posterior chamber
Zonular fibers
Iris
Lens
Ciliary body
Ora serrata
Muscular a. and v.
Extrinsic eye m.
Retina
Vitreous chamber
Long posterior ciliary a.
Choroid
Sclera
Vorticose v.
Episcleral a. and v.
Retinal a. and v.
Long posterior ciliary a.
Short posterior ciliary aa.
Central retinal a. and v.
Optic n. (CN II)


Superior temporal retinal arteriole
Superior macular arteriole and venule
Superior nasal retinal arteriole
Superior temporal retinal venule
Superior nasal retinal venule
Macula
Optic disc
Fovea centralis
Inferior nasal retinal venule
Inferior temporal retinal arteriole
Inferior nasal retinal arteriole
Inferior temporal retinal venule
Inferior macular arteriole and venule

Right retinal vessels: funduscopic view

Vascular arrangements within the vascular layer of eyeball


Anterior ciliary aa.
Superior rectus tendon
Sclera
Posterior conjunctival a. and v.
Anterior ciliary vv.
Major arterial circle of iris
Minor arterial circle of iris
Bulbar conjunctiva
Cornea
Iris
Scleral sinus (canal of Schlemm)
Veins draining scleral sinus (into anterior ciliary vv.)
Anterior ciliary vv.
Ciliary part of retina
Optic part of retina
Recurrent branch of anterior ciliary a.
Muscular a.
Anterior tributaries of vorticose v.
Episcleral v.*
Superior ophthalmic v.
Bulb of vorticose v.
Vorticose v.
Long posterior ciliary a.
Short posterior ciliary aa.
Sheaths of optic n.
Short posterior ciliary aa.
Central retinal a. and v.
Vessels of internal sheath of optic n.
Short posterior ciliary aa.
Episcleral v.*
Inferior ophthalmic v.
Posterior tributaries of vorticose v.

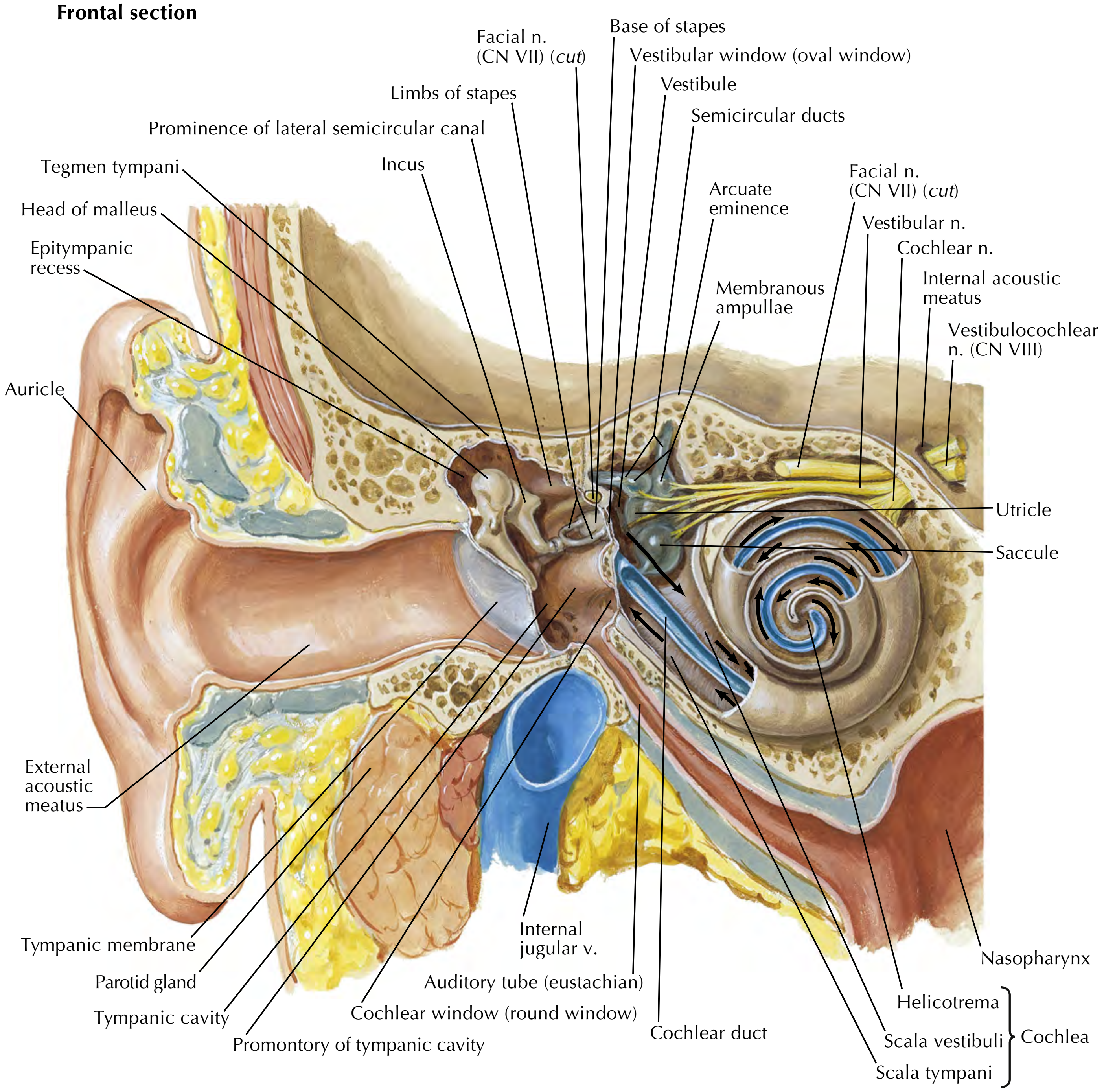
**The episcleral veins are shown here anastomosing with the vorticose veins, which they do; however, they also drain into the anterior ciliary veins.*

C.Machado M.D.

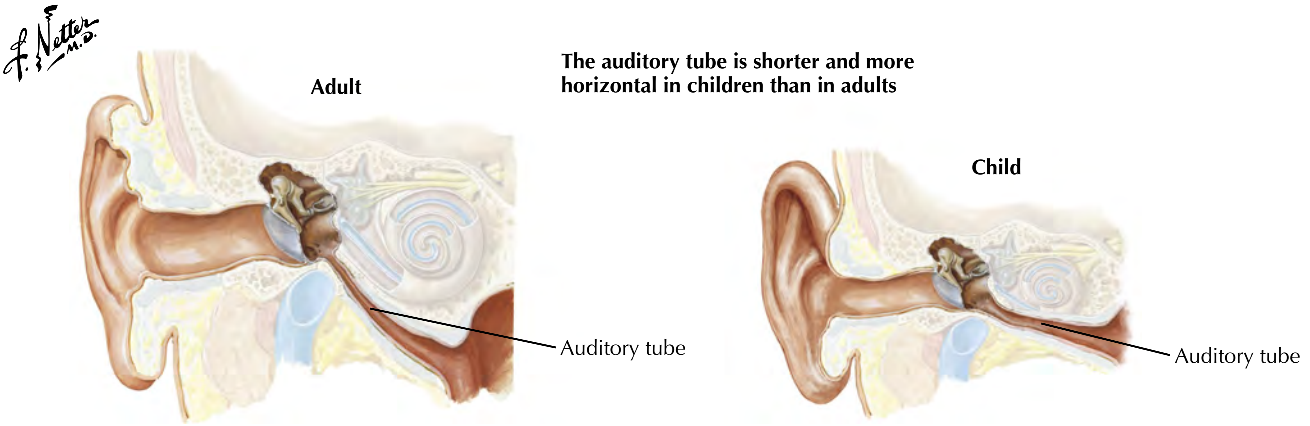
Ear and Course of Sound in Cochlea

See also **Plates BP 28, BP 29, BP 30**

Frontal section



Facial n. (CN VII) (*cut*)
Base of stapes
Vestibular window (oval window)
Vestibule
Limbs of stapes
Semicircular ducts
Prominence of lateral semicircular canal
Tegmen tympani
Incus
Arcuate eminence
Facial n. (CN VII) (*cut*)
Vestibular n.
Head of malleus
Cochlear n.
Epitympanic recess
Membranous ampullae
Internal acoustic meatus
Vestibulocochlear n. (CN VIII)
Auricle
Utricle
Saccule
External acoustic meatus
Internal jugular v.
Nasopharynx
Tympanic membrane
Parotid gland
Auditory tube (eustachian)
Tympanic cavity
Cochlear window (round window)
Cochlear duct
Promontory of tympanic cavity
Helicotrema
Scala vestibuli
Scala tympani
Cochlea



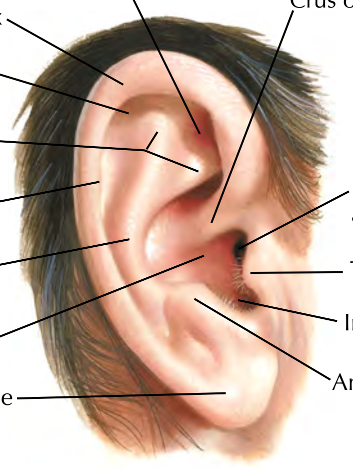
The auditory tube is shorter and more horizontal in children than in adults

Adult
Auditory tube
Child
Auditory tube

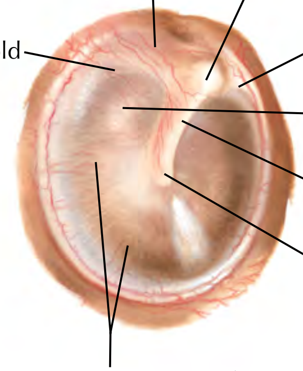
External Ear and Tympanic Cavity

See also **Plates 123, BP 28**

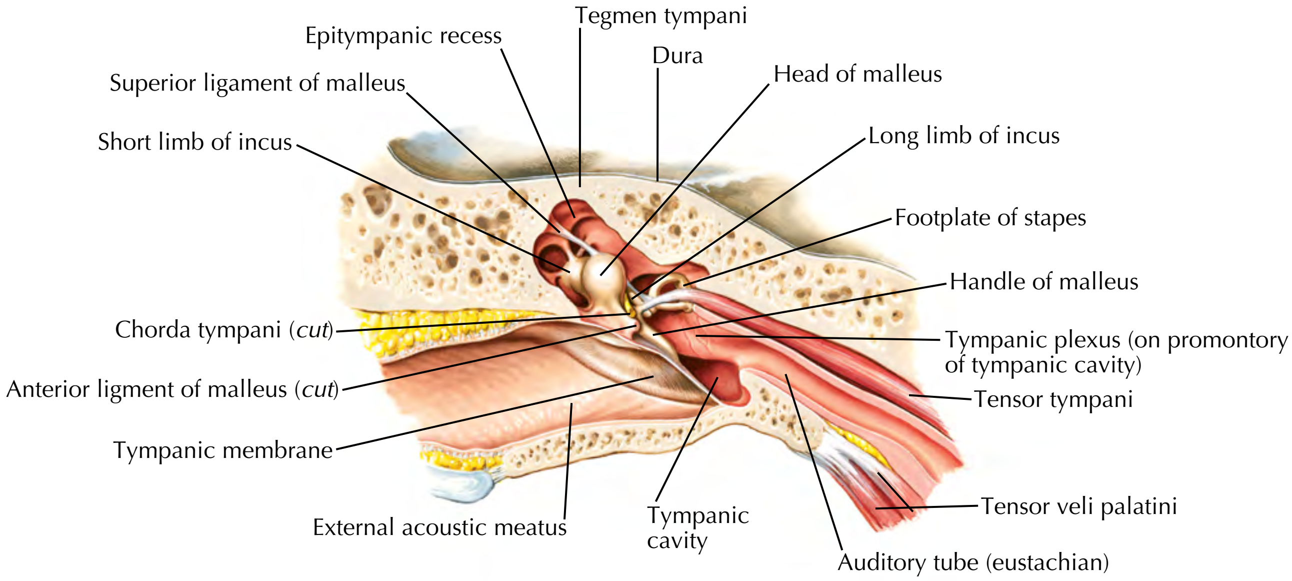
Right auricle


Triangular fossa
Helix
Crus of helix
Scapha
Crura of antihelix
Auricular tubercle (of Darwin)
External acoustic meatus
Antihelix
Tragus
Concha of auricle
Intertragic notch
Lobule of auricle
Antitragus

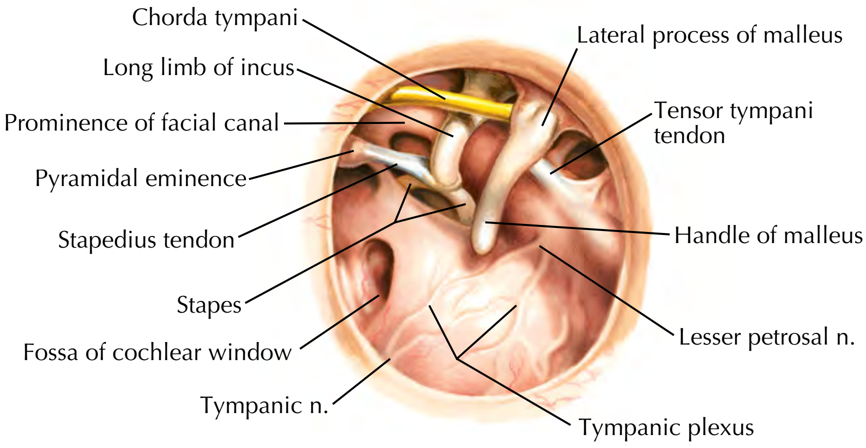
Otoscopic view of right tympanic membrane


Pars flaccida of tympanic membrane
Lateral process of malleus
Posterior mallear fold
Anterior mallear fold
Long limb of incus
Handle of malleus
Umbo of tympanic membrane
Pars tensa of tympanic membrane

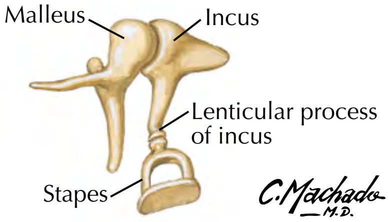
Coronal oblique section of external acoustic meatus and middle ear


Tegmen tympani
Epitympanic recess
Dura
Superior ligament of malleus
Head of malleus
Short limb of incus
Long limb of incus
Footplate of stapes
Handle of malleus
Chorda tympani (*cut*)
Tympanic plexus (on promontory of tympanic cavity)
Anterior ligment of malleus (*cut*)
Tensor tympani
Tympanic membrane
Tensor veli palatini
External acoustic meatus
Tympanic cavity
Auditory tube (eustachian)

Right tympanic cavity after removal of tympanic membrane (lateral view)


Chorda tympani
Lateral process of malleus
Long limb of incus
Prominence of facial canal
Tensor tympani tendon
Pyramidal eminence
Stapedius tendon
Handle of malleus
Stapes
Lesser petrosal n.
Fossa of cochlear window
Tympanic n.
Tympanic plexus

Auditory ossicles: medial view


Malleus
Incus
Lenticular process of incus
Stapes

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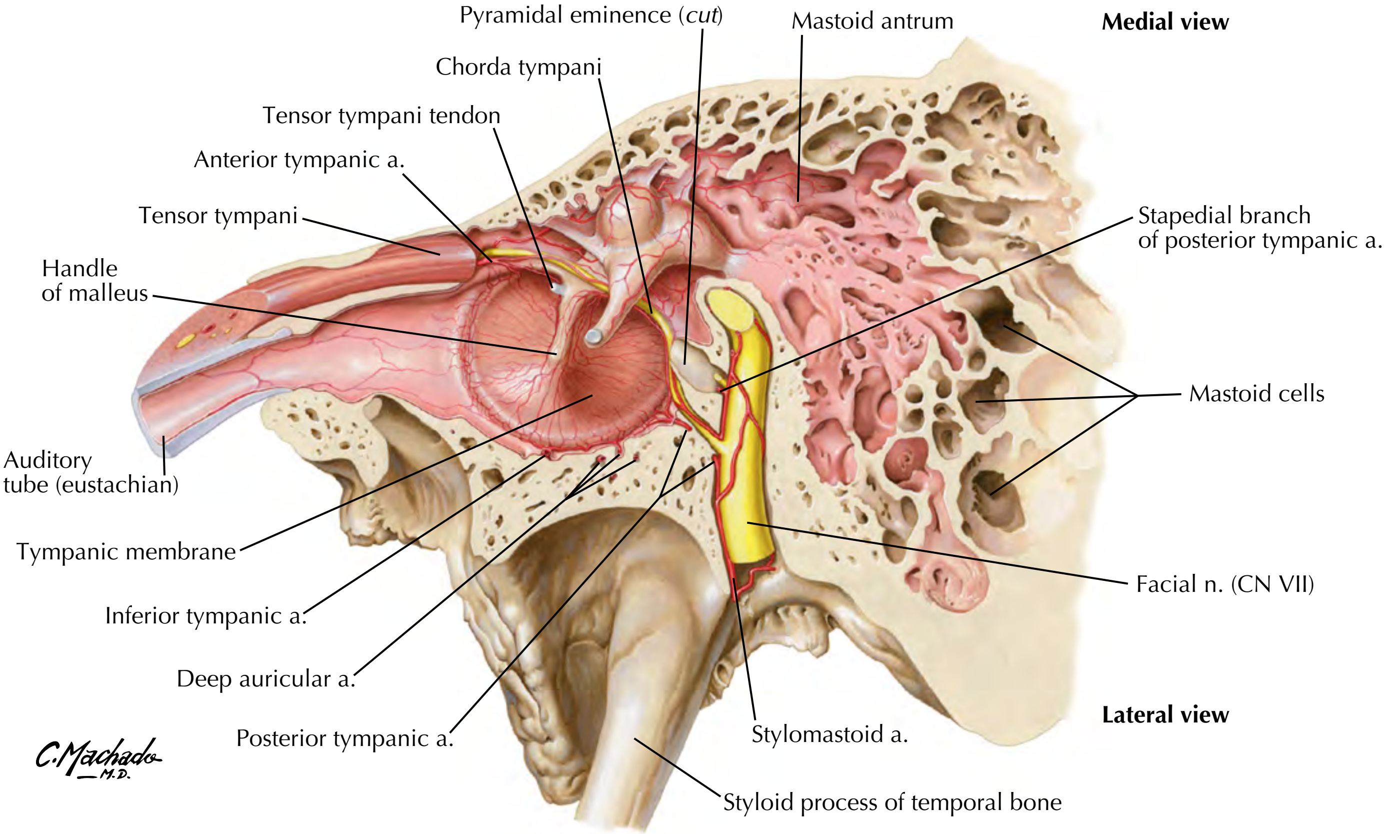
F. Netter M.D.

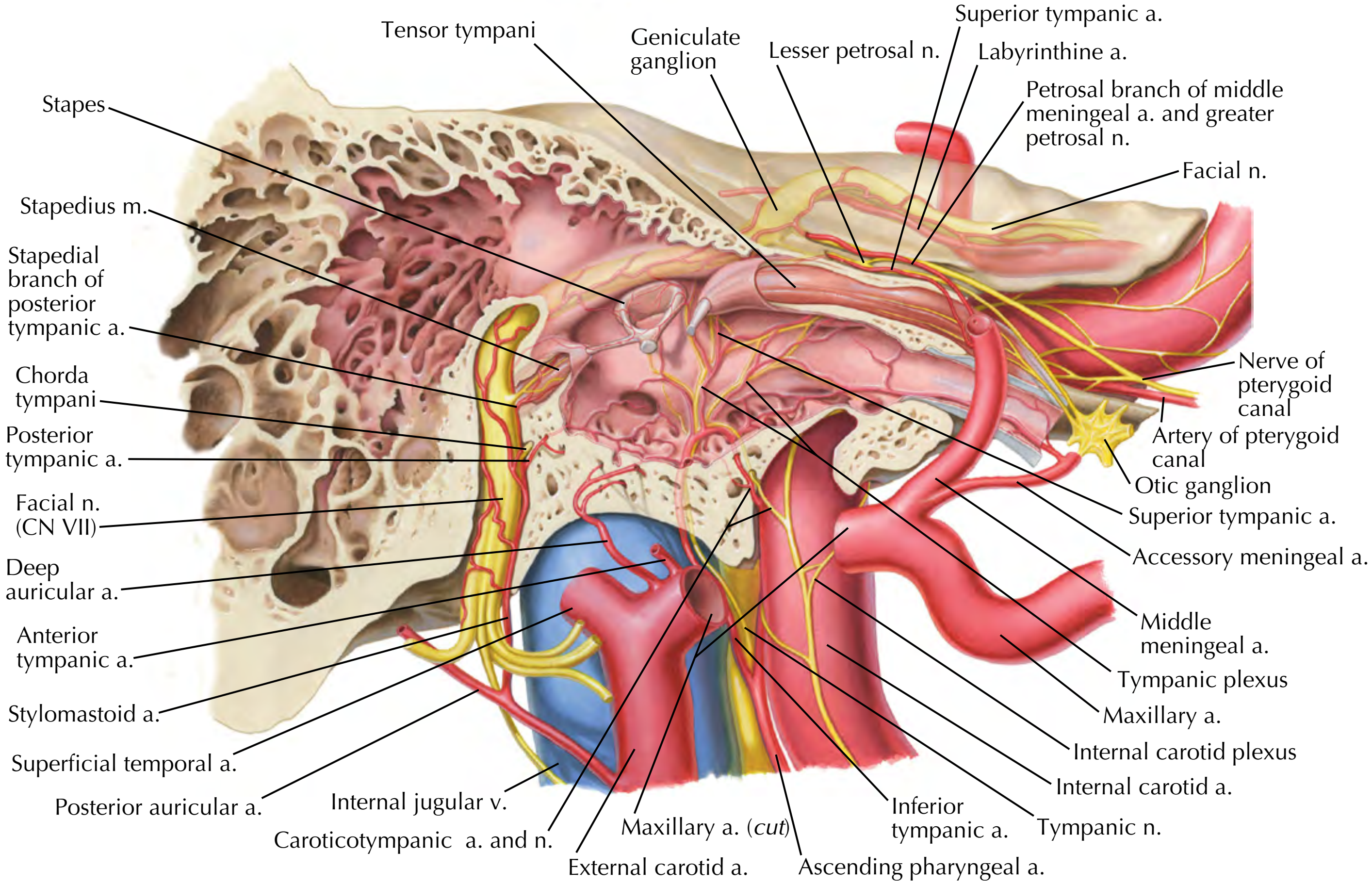
Tympanic Cavity

See also **Plates 77, 162, BP 28**

Medial view


Pyramidal eminence (*cut*)
Mastoid antrum
Chorda tympani
Tensor tympani tendon
Anterior tympanic a.
Tensor tympani
Handle of malleus
Stapedial branch of posterior tympanic a.
Mastoid cells
Auditory tube (eustachian)
Tympanic membrane
Facial n. (CN VII)
Inferior tympanic a.
Deep auricular a.
Posterior tympanic a.
Stylomastoid a.
Styloid process of temporal bone
C. Machado M.D.

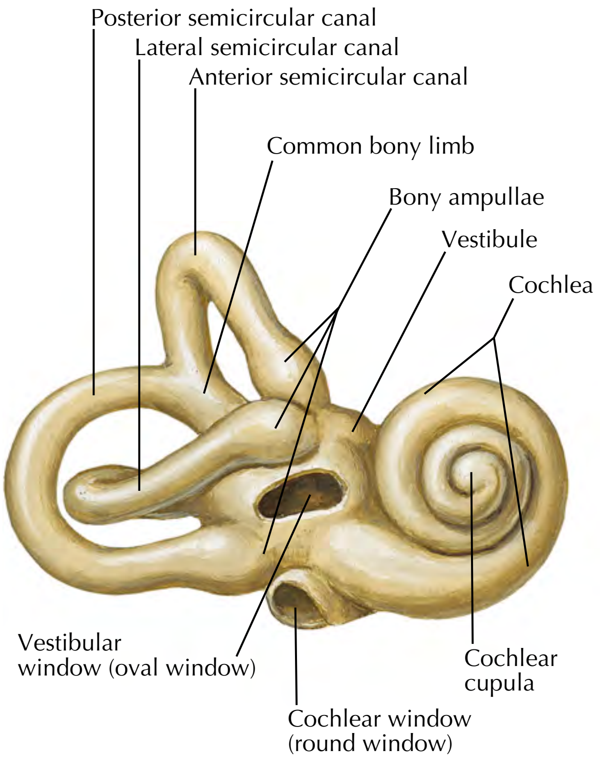
Lateral view


Tensor tympani
Geniculate ganglion
Lesser petrosal n.
Superior tympanic a.
Labyrinthine a.
Petrosal branch of middle meningeal a. and greater petrosal n.
Facial n.
Stapes
Stapedius m.
Stapedial branch of posterior tympanic a.
Chorda tympani
Posterior tympanic a.
Facial n. (CN VII)
Deep auricular a.
Anterior tympanic a.
Stylomastoid a.
Superficial temporal a.
Posterior auricular a.
Nerve of pterygoid canal
Artery of pterygoid canal
Otic ganglion
Superior tympanic a.
Accessory meningeal a.
Middle meningeal a.
Tympanic plexus
Maxillary a.
Internal carotid plexus
Internal carotid a.
Inferior tympanic a.
Tympanic n.
Internal jugular v.
Caroticotympanic a. and n.
Maxillary a. (*cut*)
External carotid a.
Ascending pharyngeal a.

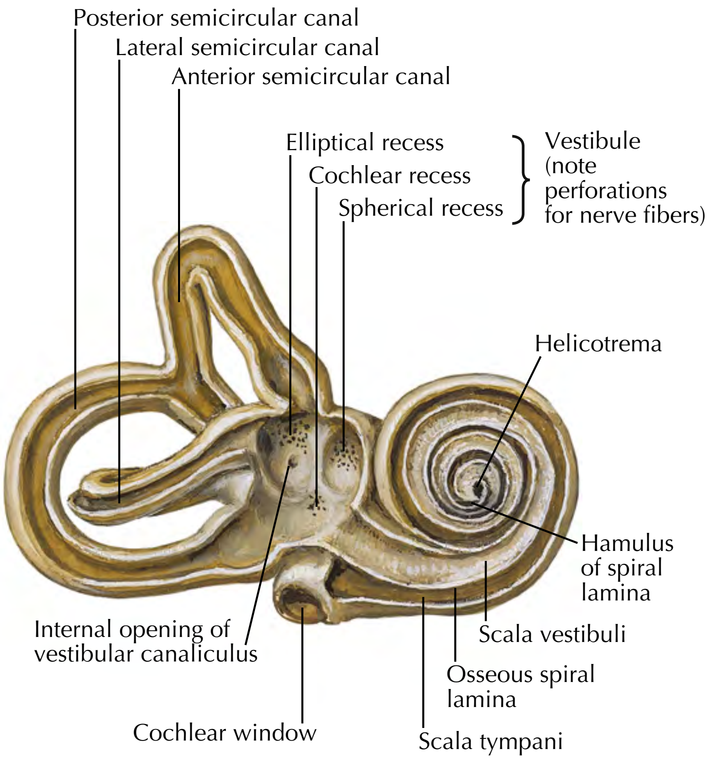
Bony and Membranous Labyrinths

See also **Plate 151**

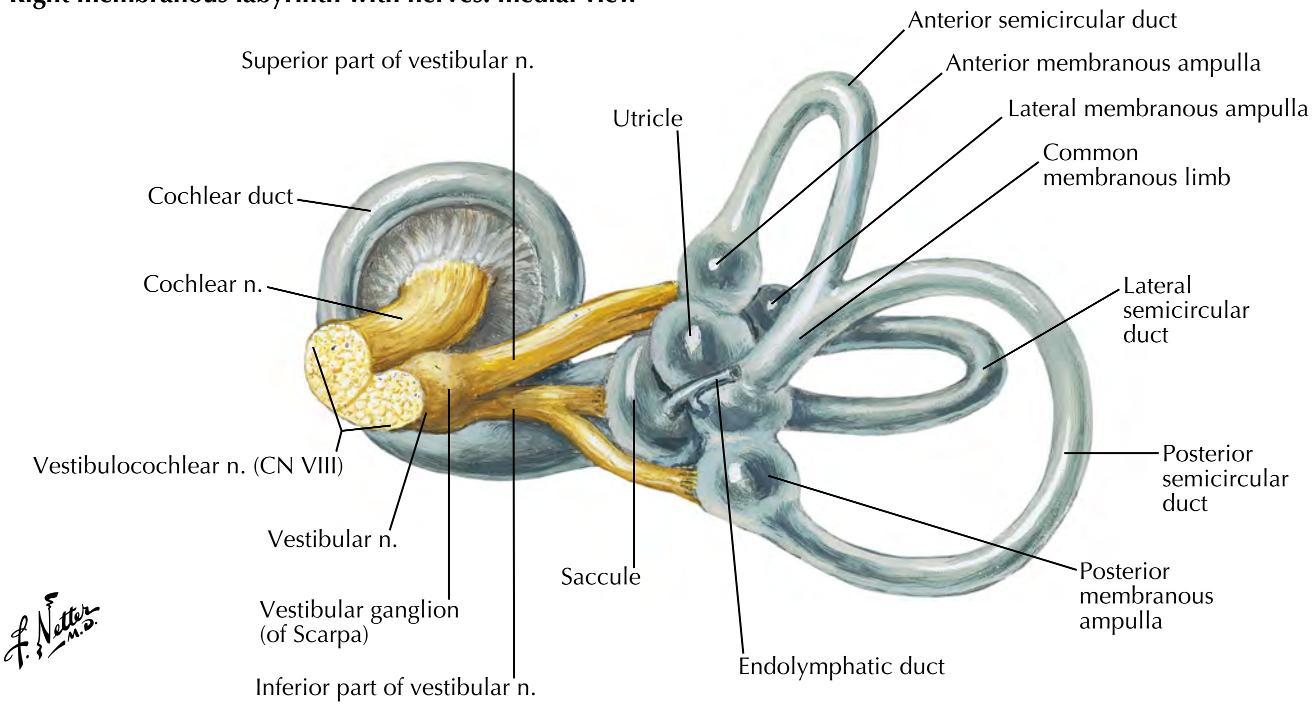
Right bony labyrinth (otic capsule), anterolateral view: surrounding cancellous bone removed


Posterior semicircular canal
Lateral semicircular canal
Anterior semicircular canal
Common bony limb
Bony ampullae
Vestibule
Cochlea
Vestibular window (oval window)
Cochlear cupula
Cochlear window (round window)

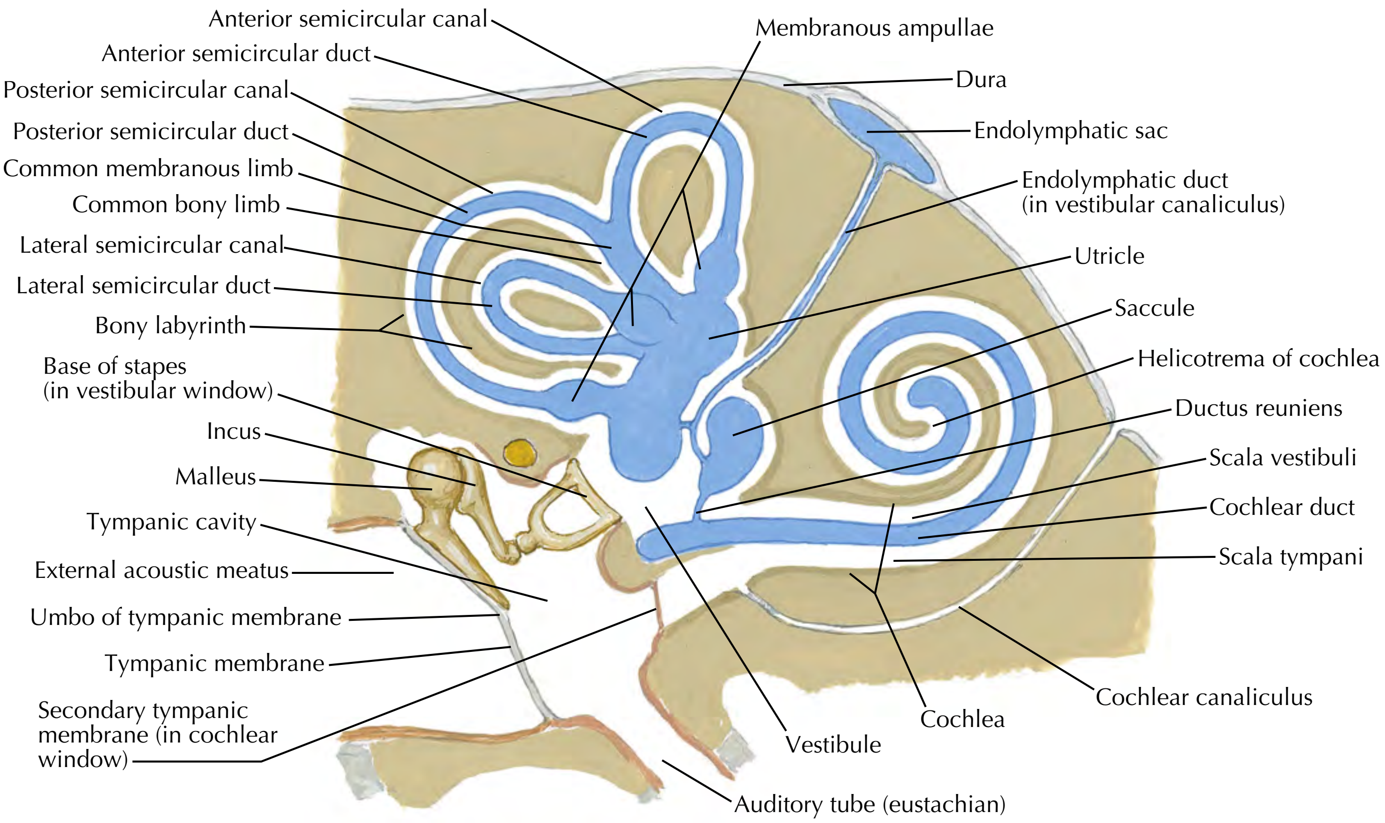
Dissected right bony labyrinth (otic capsule): membranous labyrinth removed


Posterior semicircular canal
Lateral semicircular canal
Anterior semicircular canal
Elliptical recess
Cochlear recess
Spherical recess
Vestibule (note perforations for nerve fibers)
Helicotrema
Hamulus of spiral lamina
Scala vestibuli
Osseous spiral lamina
Internal opening of vestibular canaliculus
Cochlear window
Scala tympani

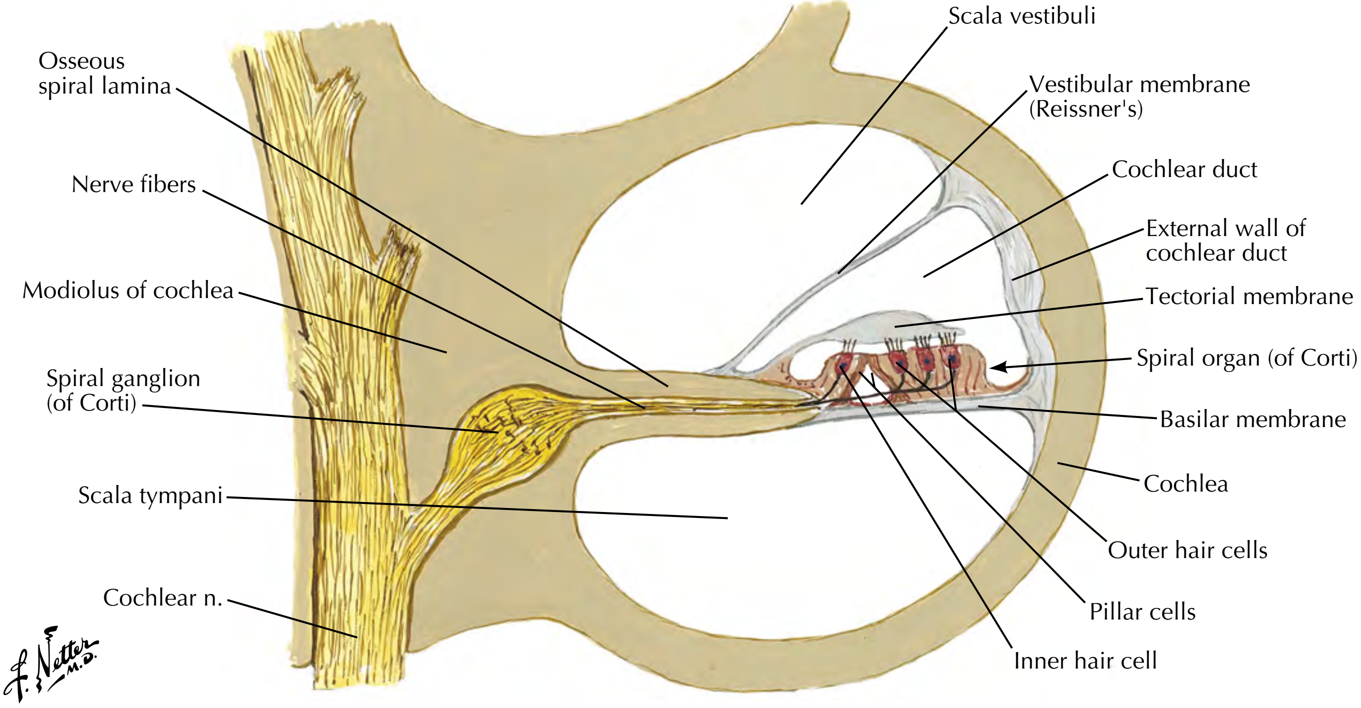
Right membranous labyrinth with nerves: medial view


Anterior semicircular duct
Superior part of vestibular n.
Anterior membranous ampulla
Utricle
Lateral membranous ampulla
Common membranous limb
Cochlear duct
Cochlear n.
Lateral semicircular duct
Posterior semicircular duct
Vestibulocochlear n. (CN VIII)
Vestibular n.
Saccule
Posterior membranous ampulla
Vestibular ganglion (of Scarpa)
Endolymphatic duct
Inferior part of vestibular n.

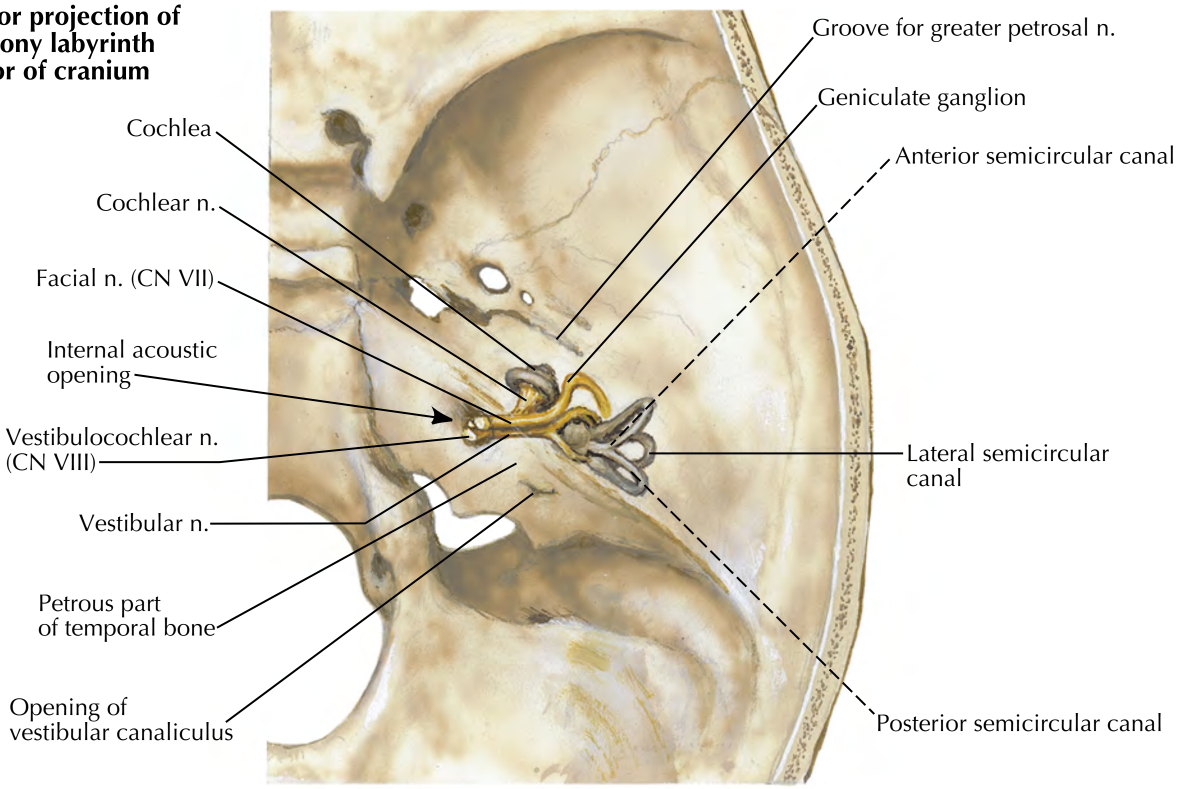
Bony and membranous labyrinths: schema


Anterior semicircular canal
Anterior semicircular duct
Posterior semicircular canal
Posterior semicircular duct
Common membranous limb
Common bony limb
Lateral semicircular canal
Lateral semicircular duct
Bony labyrinth
Base of stapes (in vestibular window)
Incus
Malleus
Tympanic cavity
External acoustic meatus
Umbo of tympanic membrane
Tympanic membrane
Secondary tympanic membrane (in cochlear window)
Membranous ampullae
Dura
Endolymphatic sac
Endolymphatic duct (in vestibular canaliculus)
Utricle
Saccule
Helicotrema of cochlea
Ductus reuniens
Scala vestibuli
Cochlear duct
Scala tympani
Cochlear canaliculus
Cochlea
Vestibule
Auditory tube (eustachian)

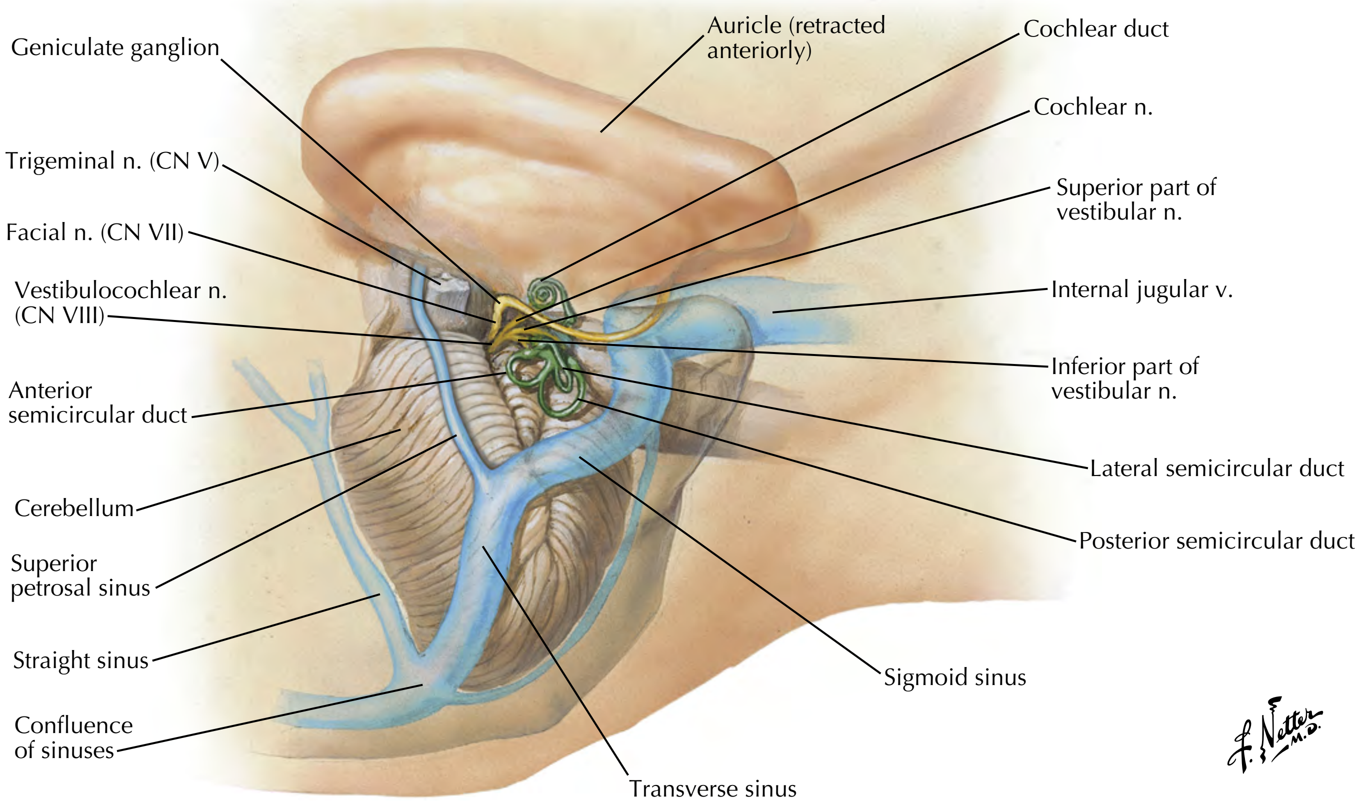
Section through turn of cochlea


Osseous spiral lamina
Nerve fibers
Modiolus of cochlea
Spiral ganglion (of Corti)
Scala tympani
Cochlear n.
Scala vestibuli
Vestibular membrane (Reissner's)
Cochlear duct
External wall of cochlear duct
Tectorial membrane
Spiral organ (of Corti)
Basilar membrane
Cochlea
Outer hair cells
Pillar cells
Inner hair cell

Superior projection of right bony labyrinth on floor of cranium


Cochlea
Cochlear n.
Facial n. (CN VII)
Internal acoustic opening
Vestibulocochlear n. (CN VIII)
Vestibular n.
Petrous part of temporal bone
Opening of vestibular canaliculus
Groove for greater petrosal n.
Geniculate ganglion
Anterior semicircular canal
Lateral semicircular canal
Posterior semicircular canal

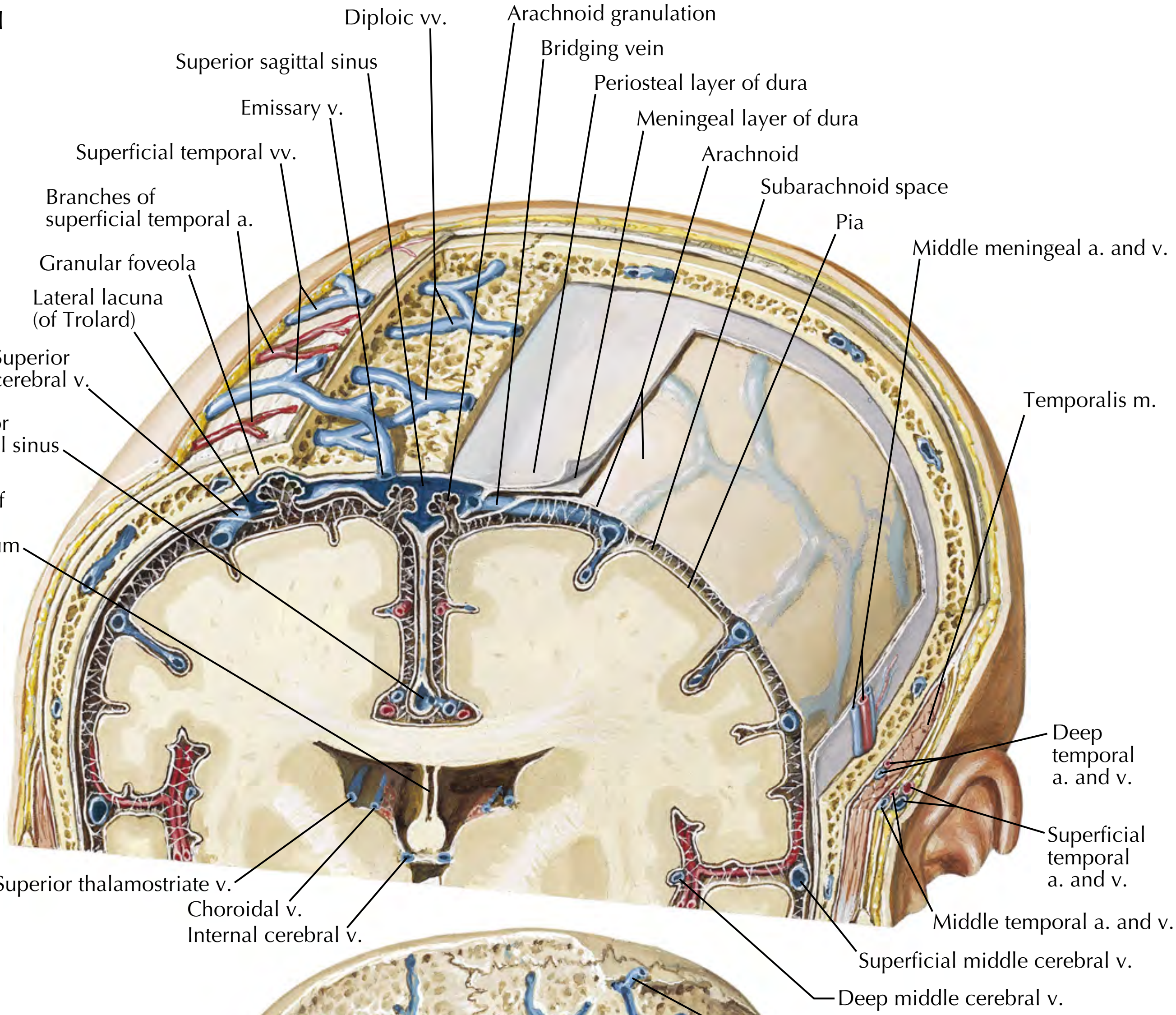
Lateral projection of right membranous labyrinth


Geniculate ganglion
Trigeminal n. (CN V)
Facial n. (CN VII)
Vestibulocochlear n. (CN VIII)
Anterior semicircular duct
Cerebellum
Superior petrosal sinus
Straight sinus
Confluence of sinuses
Transverse sinus
Auricle (retracted anteriorly)
Cochlear duct
Cochlear n.
Superior part of vestibular n.
Internal jugular v.
Inferior part of vestibular n.
Lateral semicircular duct
Posterior semicircular duct
Sigmoid sinus
F. Netter M.D.

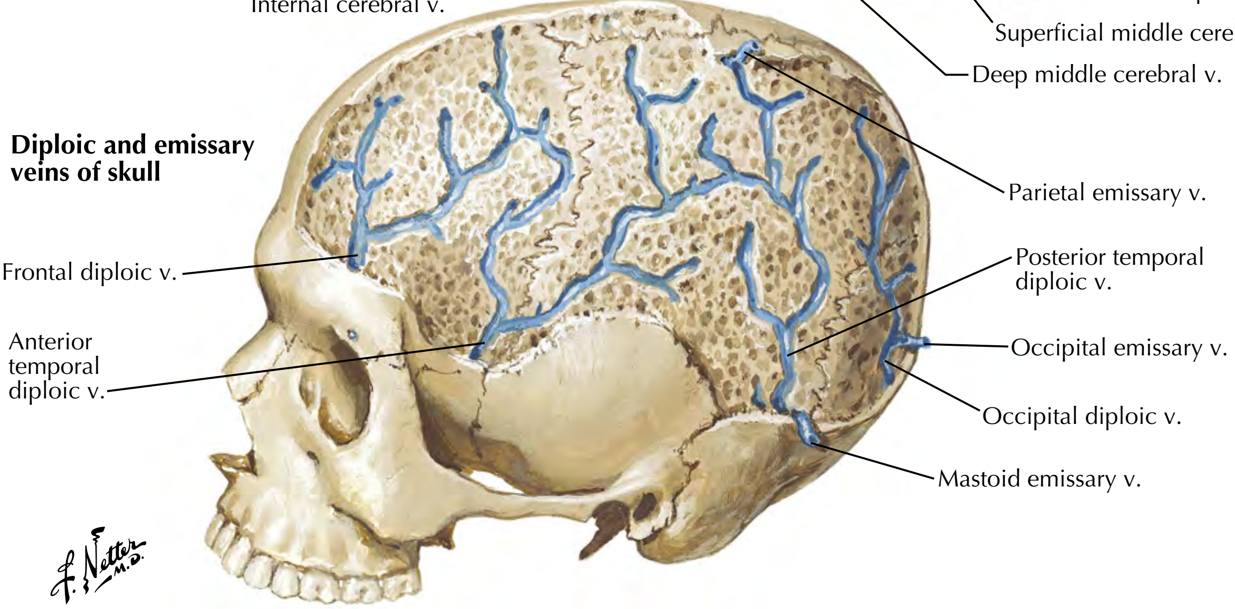
Meninges and Diploic Veins

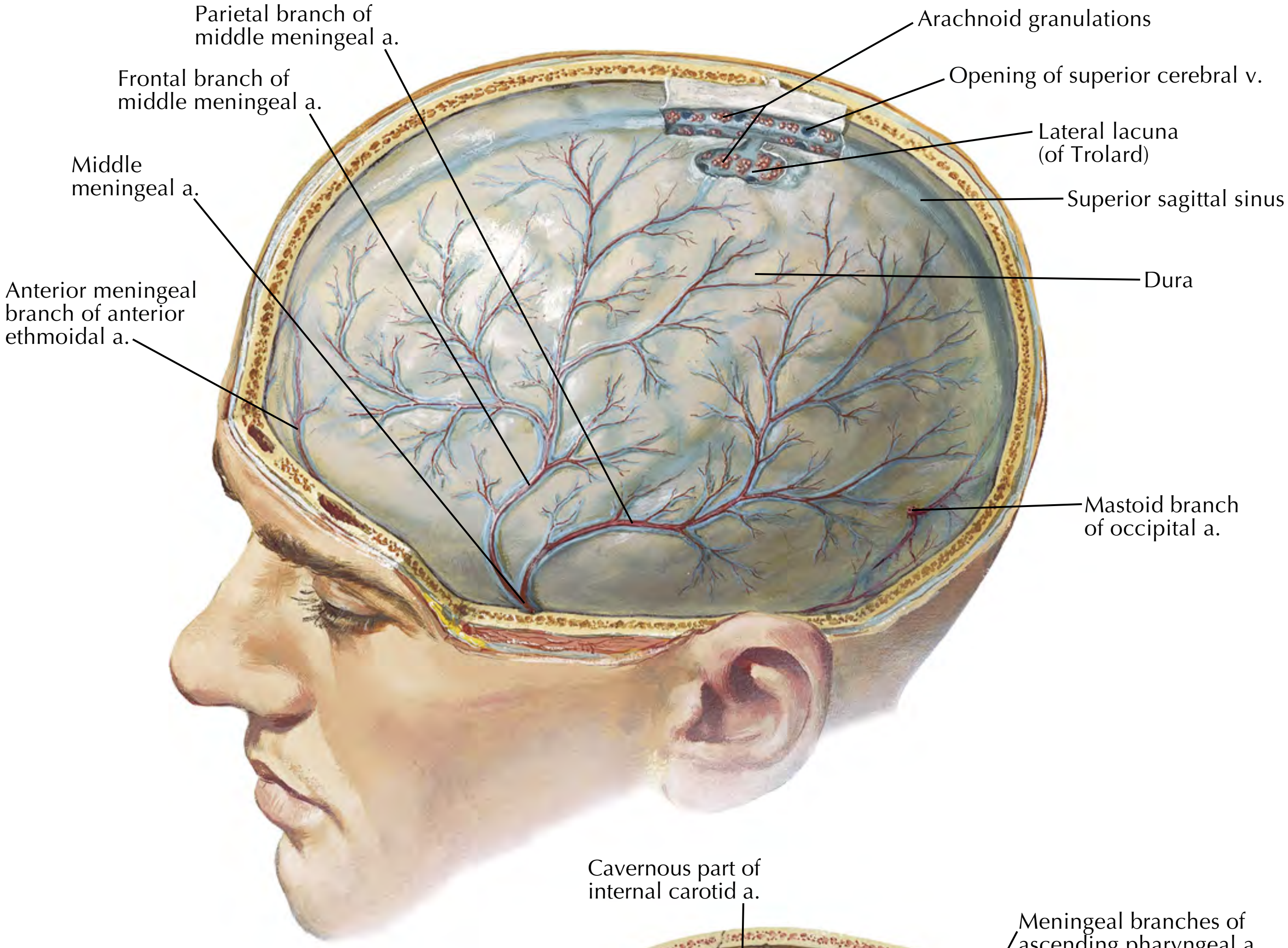
See also **Plate 24**

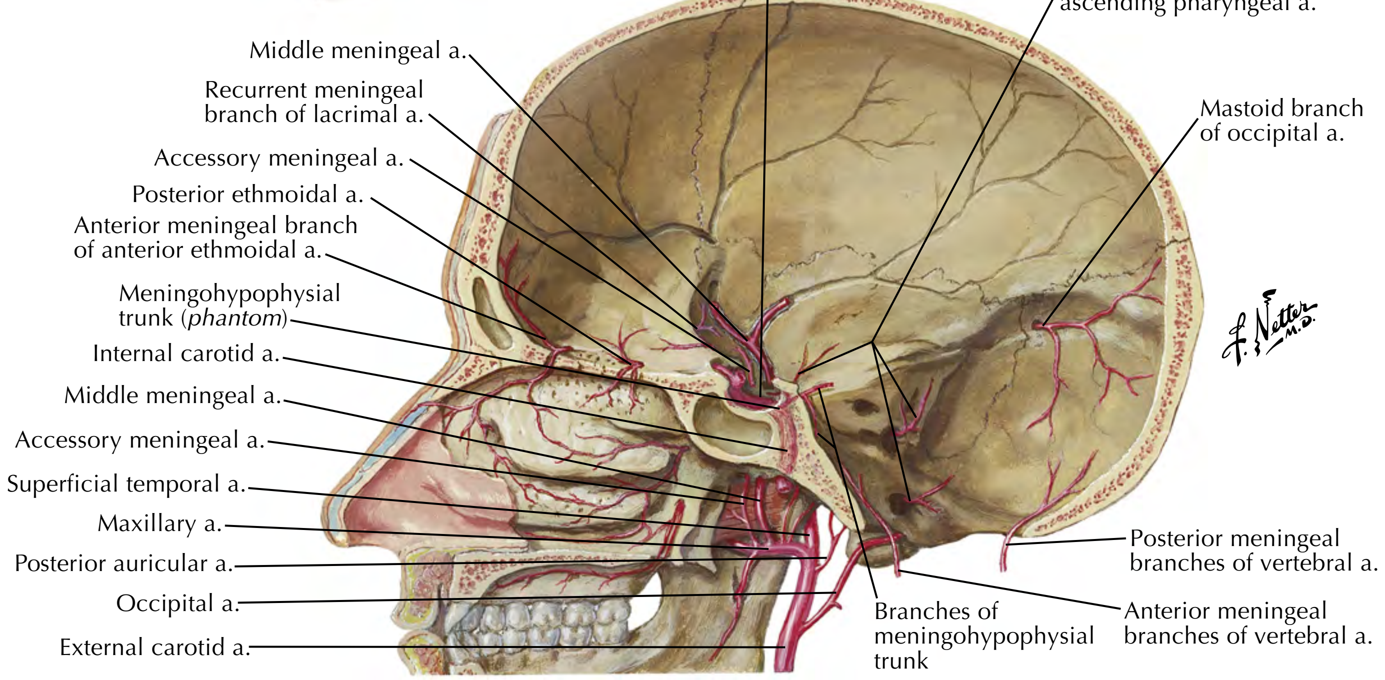
Coronal view


Diploic vv.
Arachnoid granulation
Bridging vein
Superior sagittal sinus
Periosteal layer of dura
Emissary v.
Meningeal layer of dura
Superficial temporal vv.
Arachnoid
Subarachnoid space
Branches of superficial temporal a.
Pia
Middle meningeal a. and v.
Granular foveola
Lateral lacuna (of Trolard)
Superior cerebral v.
Temporalis m.
Inferior sagittal sinus
Cavum of septum pellucidum
Deep temporal a. and v.
Superficial temporal a. and v.
Superior thalamostriate v.
Choroidal v.
Internal cerebral v.
Middle temporal a. and v.
Superficial middle cerebral v.
Deep middle cerebral v.

Diploic and emissary veins of skull

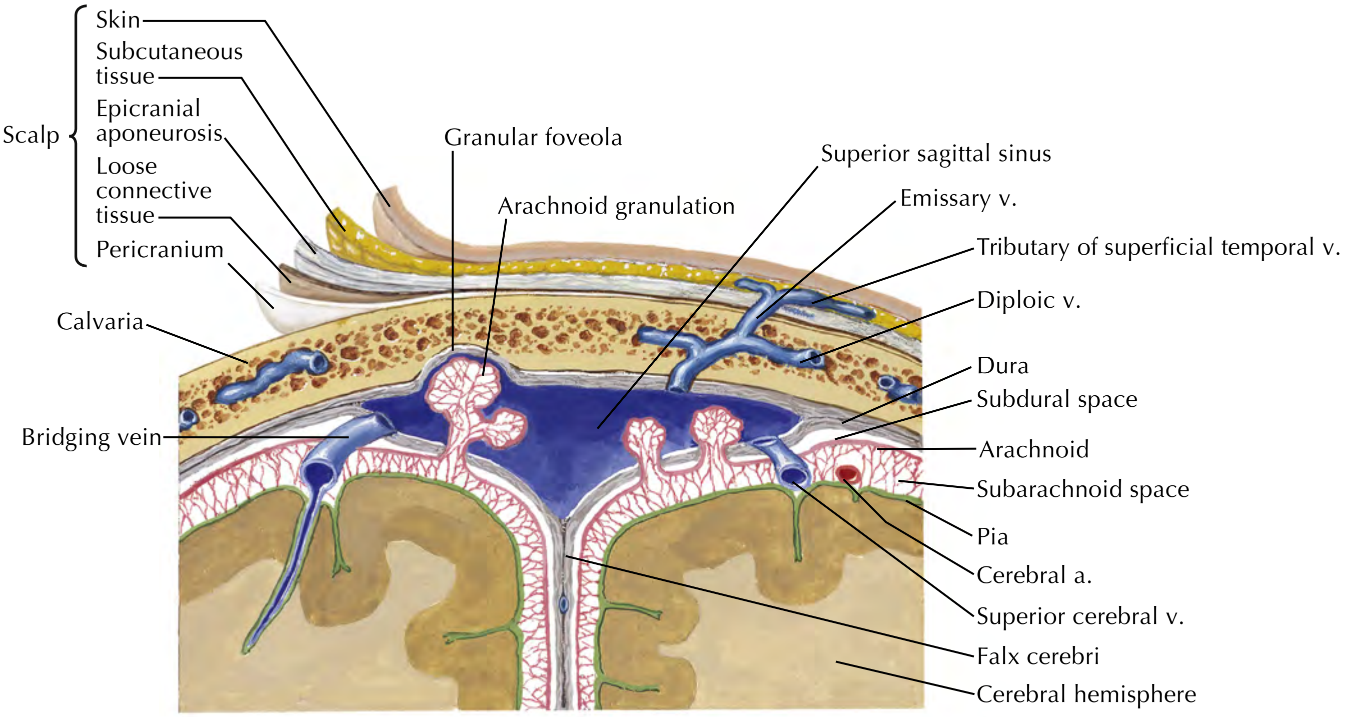

Parietal emissary v.
Frontal diploic v.
Posterior temporal diploic v.
Anterior temporal diploic v.
Occipital emissary v.
Occipital diploic v.
Mastoid emissary v.


Parietal branch of middle meningeal a.
Frontal branch of middle meningeal a.
Middle meningeal a.
Anterior meningeal branch of anterior ethmoidal a.
Arachnoid granulations
Opening of superior cerebral v.
Lateral lacuna (of Trolard)
Superior sagittal sinus
Dura
Mastoid branch of occipital a.

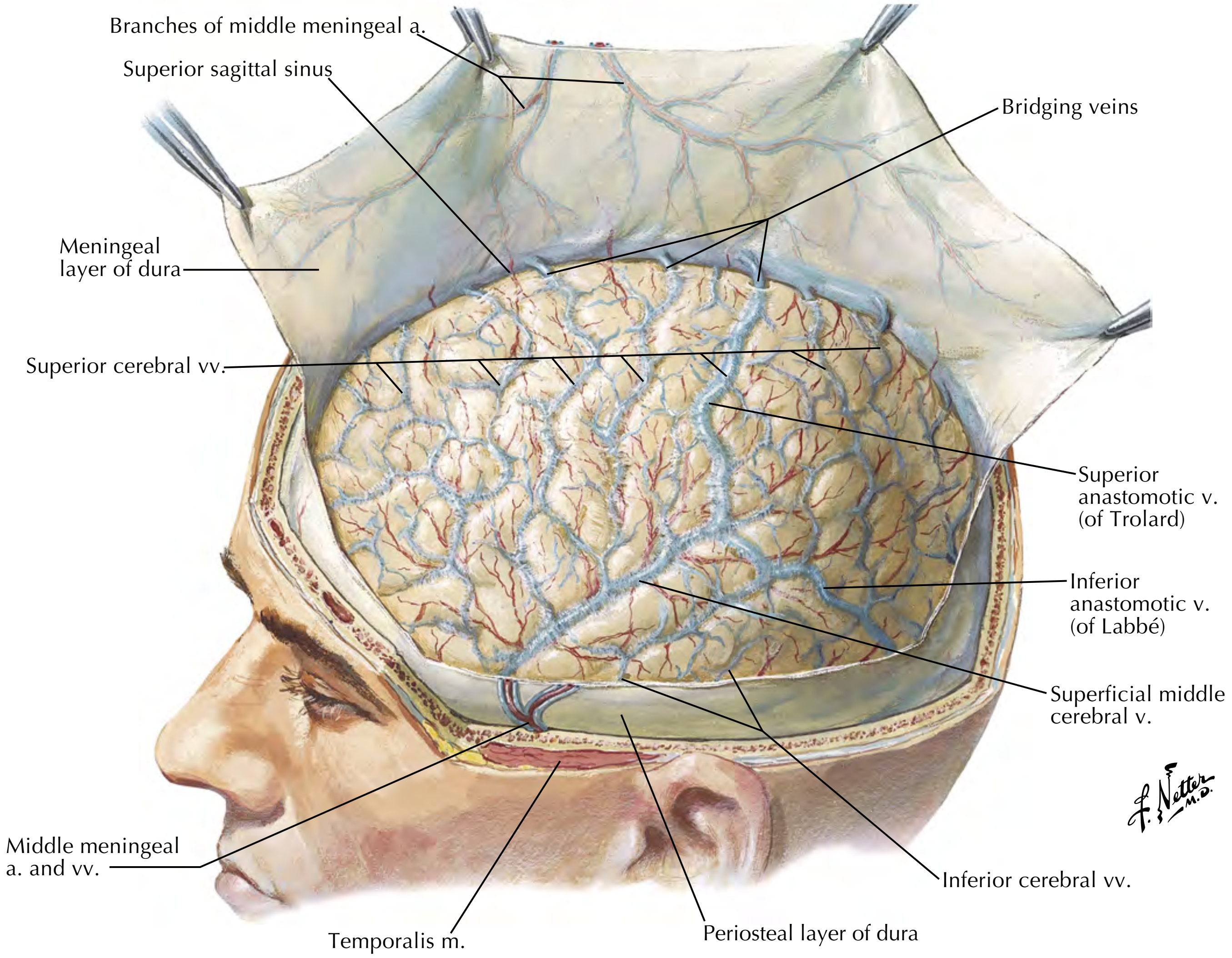

Cavernous part of internal carotid a.
Meningeal branches of ascending pharyngeal a.
Middle meningeal a.
Recurrent meningeal branch of lacrimal a.
Accessory meningeal a.
Posterior ethmoidal a.
Anterior meningeal branch of anterior ethmoidal a.
Meningohypophysial trunk (*phantom*)
Internal carotid a.
Middle meningeal a.
Accessory meningeal a.
Superficial temporal a.
Maxillary a.
Posterior auricular a.
Occipital a.
External carotid a.
Mastoid branch of occipital a.
F. Netter M.D.
Posterior meningeal branches of vertebral a.
Anterior meningeal branches of vertebral a.
Branches of meningohypophysial trunk

Meninges and Superficial Cerebral Veins

For deep veins of brain see **Plate 172**



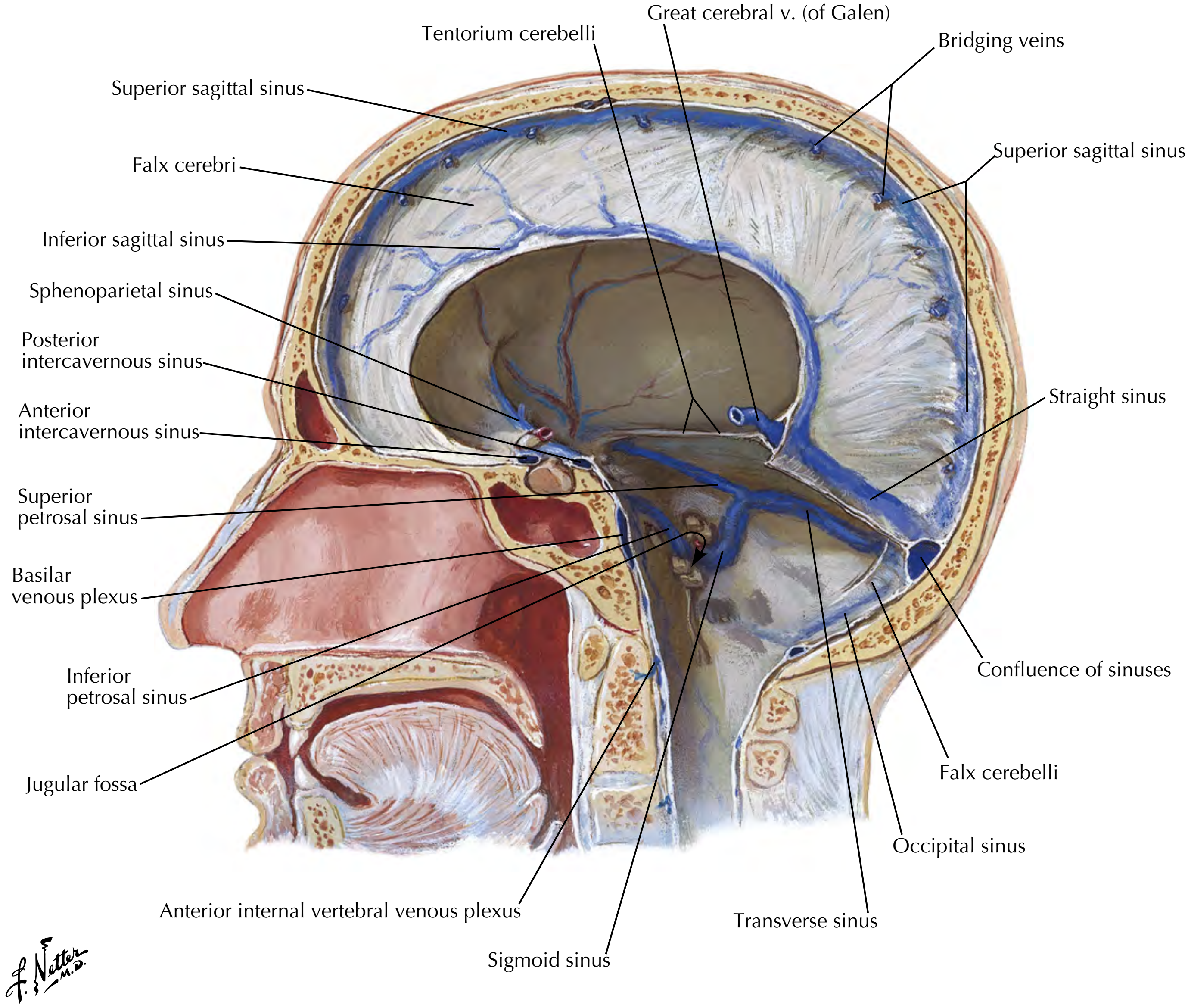
Scalp
Skin
Subcutaneous tissue
Epicranial aponeurosis
Loose connective tissue
Pericranium
Calvaria
Bridging vein
Granular foveola
Arachnoid granulation
Superior sagittal sinus
Emissary v.
Tributary of superficial temporal v.
Diploic v.
Dura
Subdural space
Arachnoid
Subarachnoid space
Pia
Cerebral a.
Superior cerebral v.
Falx cerebri
Cerebral hemisphere



Branches of middle meningeal a.
Superior sagittal sinus
Bridging veins
Meningeal layer of dura
Superior cerebral vv.
Superior anastomotic v. (of Trolard)
Inferior anastomotic v. (of Labbé)
Superficial middle cerebral v.
Middle meningeal a. and vv.
Temporalis m.
Periosteal layer of dura
Inferior cerebral vv.

Dural Venous Sinuses: Sagittal Section

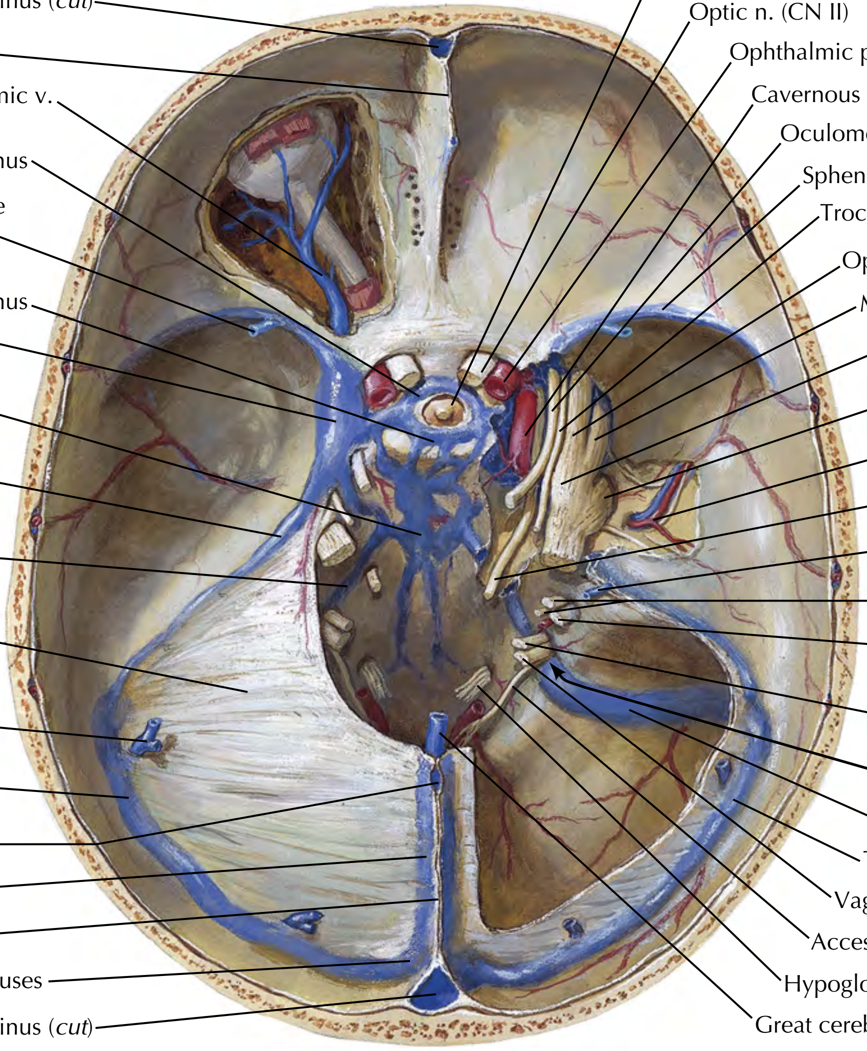
See also **Plates 127, 133**


Great cerebral v. (of Galen)
Tentorium cerebelli
Bridging veins
Superior sagittal sinus
Superior sagittal sinus
Falx cerebri
Inferior sagittal sinus
Sphenoparietal sinus
Posterior intercavernous sinus
Anterior intercavernous sinus
Straight sinus
Superior petrosal sinus
Basilar venous plexus
Confluence of sinuses
Inferior petrosal sinus
Falx cerebelli
Jugular fossa
Occipital sinus
Anterior internal vertebral venous plexus
Transverse sinus
Sigmoid sinus
F. Netter M.D.

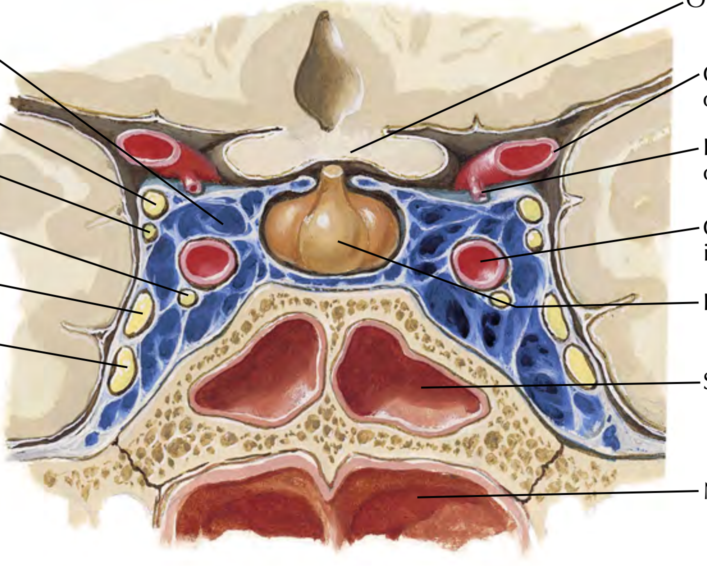
Dural Venous Sinuses: Cranial Base

See also **Plates 82, 113**

Skull sectioned horizontally: superior view

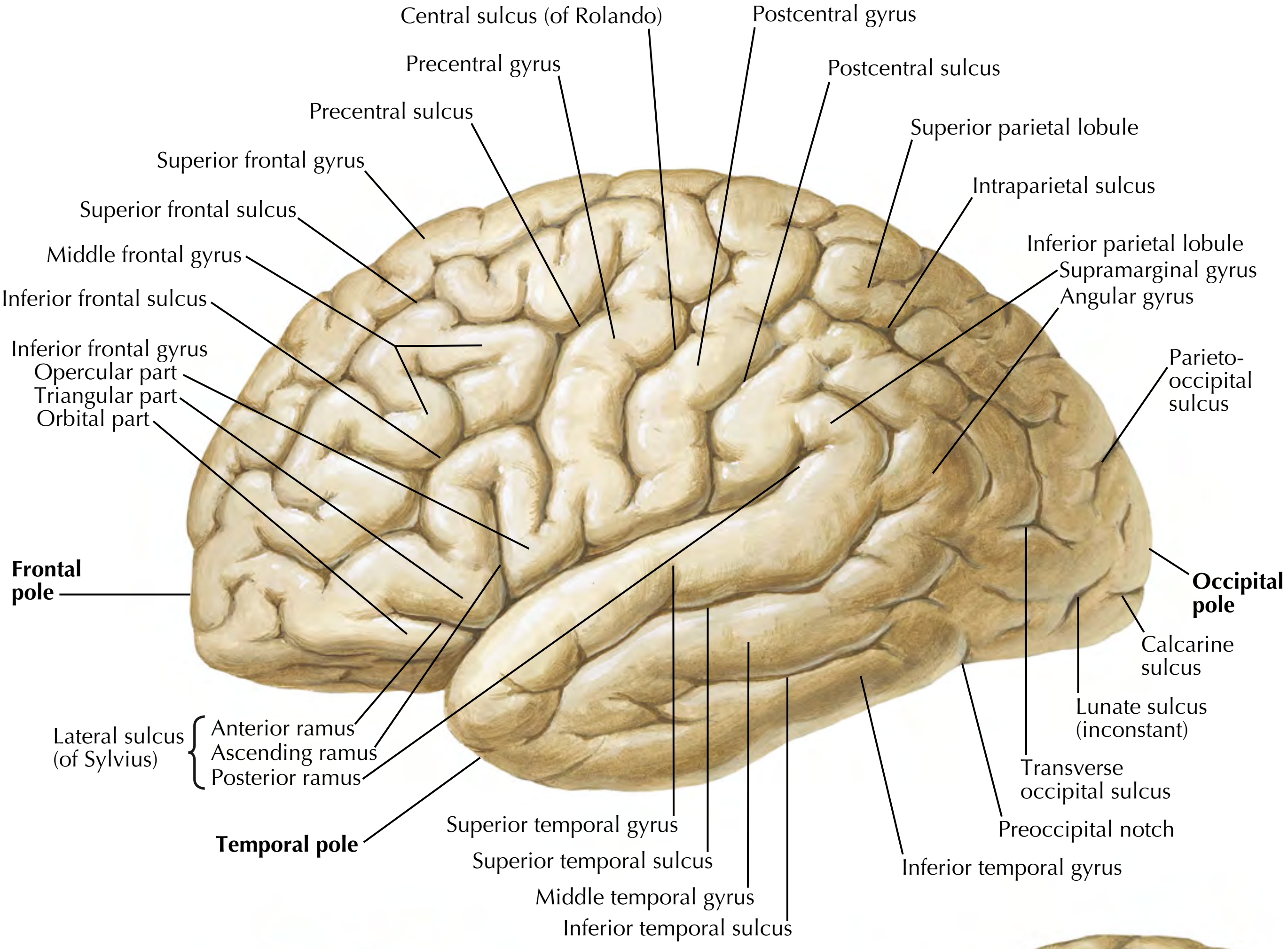


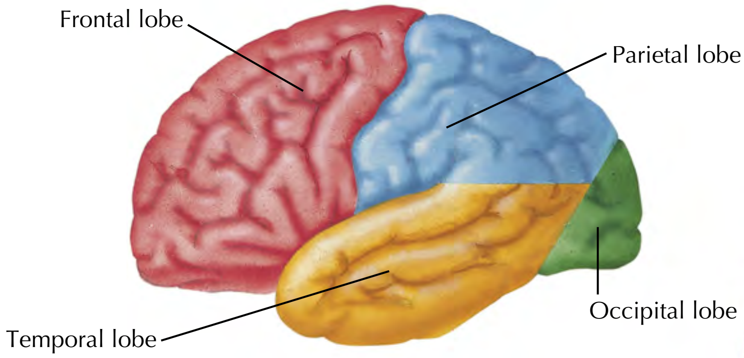
Superior sagittal sinus (*cut*)
Falx cerebri (*cut*)
Superior ophthalmic v.
Anterior intercavernous sinus
Superficial middle cerebral v. (*cut*)
Posterior intercavernous sinus
Cavernous sinus
Basilar venous plexus
Superior petrosal sinus
Inferior petrosal sinus
Tentorium cerebelli
Inferior cerebral v. (*cut*)
Transverse sinus
Inferior sagittal sinus (*cut*)
Straight sinus
Falx cerebri (*cut*)
Confluence of sinuses
Superior sagittal sinus (*cut*)
Pituitary gland
Optic n. (CN II)
Ophthalmic part of internal carotid a.
Cavernous part of internal carotid a.
Oculomotor n. (CN III)
Sphenoparietal sinus
Trochlear n. (CN IV)
Ophthalmic n. (CN V_1)
Maxillary n. (CN V_2)
Trigeminal ganglion
Mandibular n. (CN V_3)
Middle meningeal a.
Abducens n. (CN VI)
Petrosal v.
Facial n. (CN VII)
Vestibulocochlear n. (CN VIII)
Glossopharyngeal n. (CN IX)
Jugular foramen
Sigmoid sinus
Transverse sinus
Vagus n. (CN X)
Accessory n. (CN XI)
Hypoglossal n. (CN XII)
Great cerebral v. (of Galen)

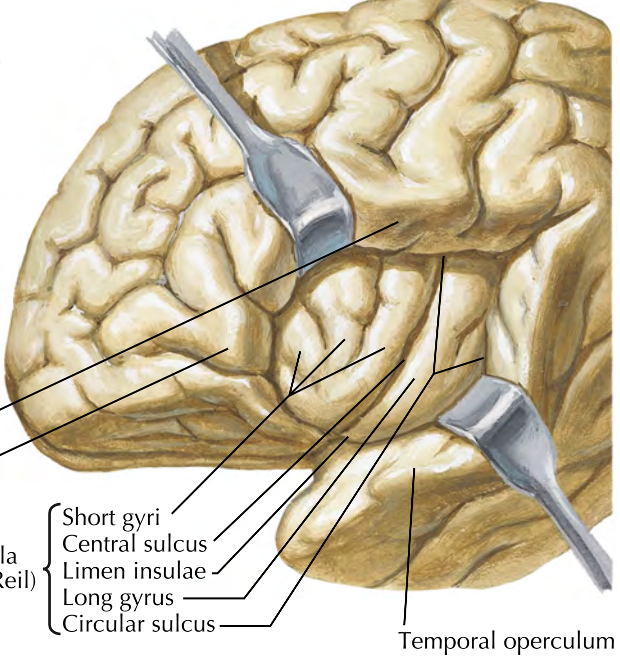


Cavernous sinus
Oculomotor n. (CN III)
Trochlear n. (CN IV)
Abducens n. (CN VI)
Ophthalmic n. (CN V_1)
Maxillary n. (CN V_2)
Optic chiasm
Communicating part of internal carotid a.
Posterior communicating a.
Cavernous part of internal carotid a.
Pituitary gland
Sphenoidal sinus
Nasopharynx

Coronal section through cavernous sinus: posterior view

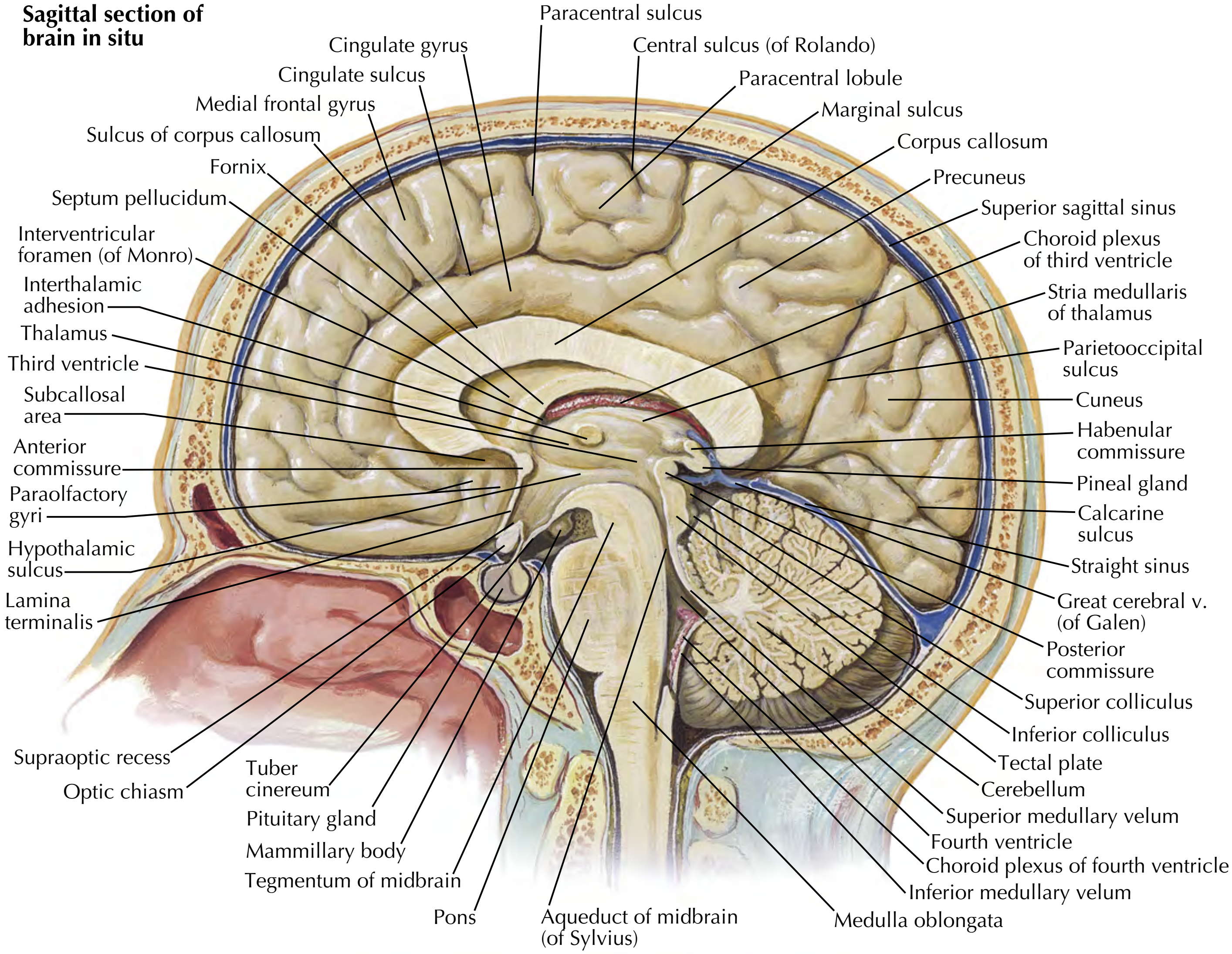

Central sulcus (of Rolando)
Postcentral gyrus
Precentral gyrus
Postcentral sulcus
Precentral sulcus
Superior parietal lobule
Superior frontal gyrus
Intraparietal sulcus
Superior frontal sulcus
Inferior parietal lobule
Supramarginal gyrus
Angular gyrus
Middle frontal gyrus
Inferior frontal sulcus
Parieto-occipital sulcus
Inferior frontal gyrus
Opercular part
Triangular part
Orbital part
Frontal pole
Occipital pole
Calcarine sulcus
Lunate sulcus (inconstant)
Lateral sulcus (of Sylvius)
Anterior ramus
Ascending ramus
Posterior ramus
Transverse occipital sulcus
Preoccipital notch
Temporal pole
Superior temporal gyrus
Superior temporal sulcus
Middle temporal gyrus
Inferior temporal sulcus
Inferior temporal gyrus


Frontal lobe
Parietal lobe
Temporal lobe
Occipital lobe

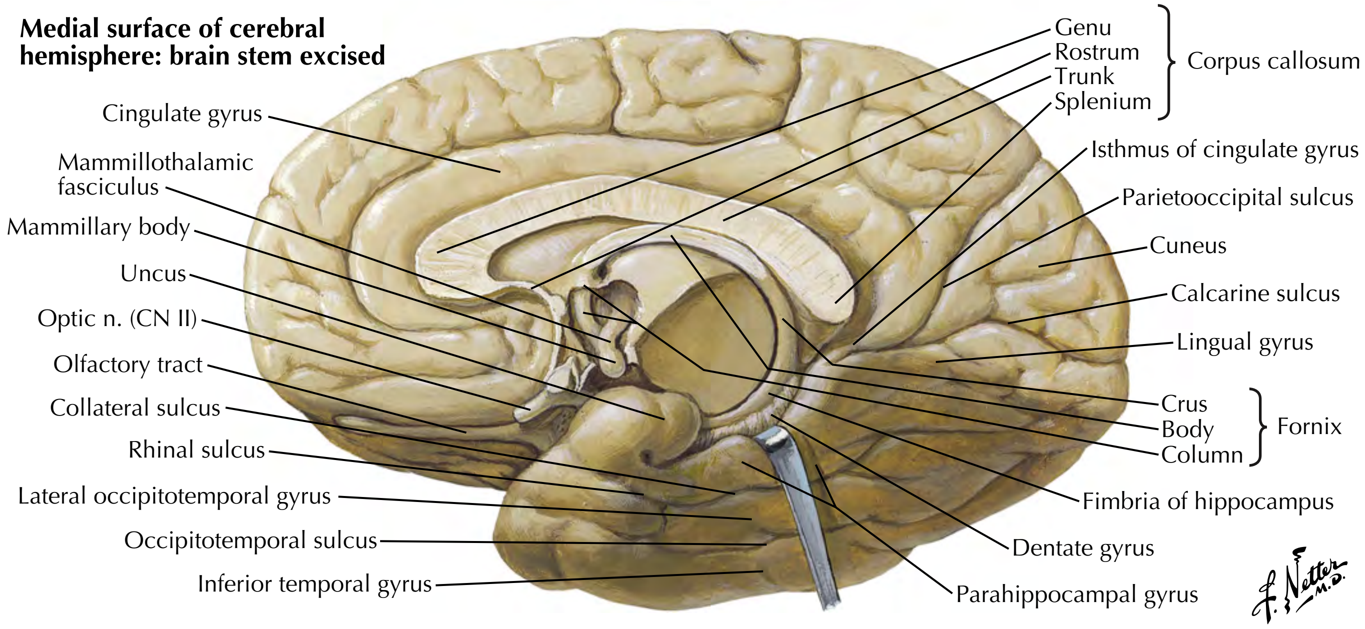

Parietal operculum
Frontal operculum
Insula (of Reil)
Short gyri
Central sulcus
Limen insulae
Long gyrus
Circular sulcus
Temporal operculum

Brain: Medial Views

Sagittal section of brain in situ

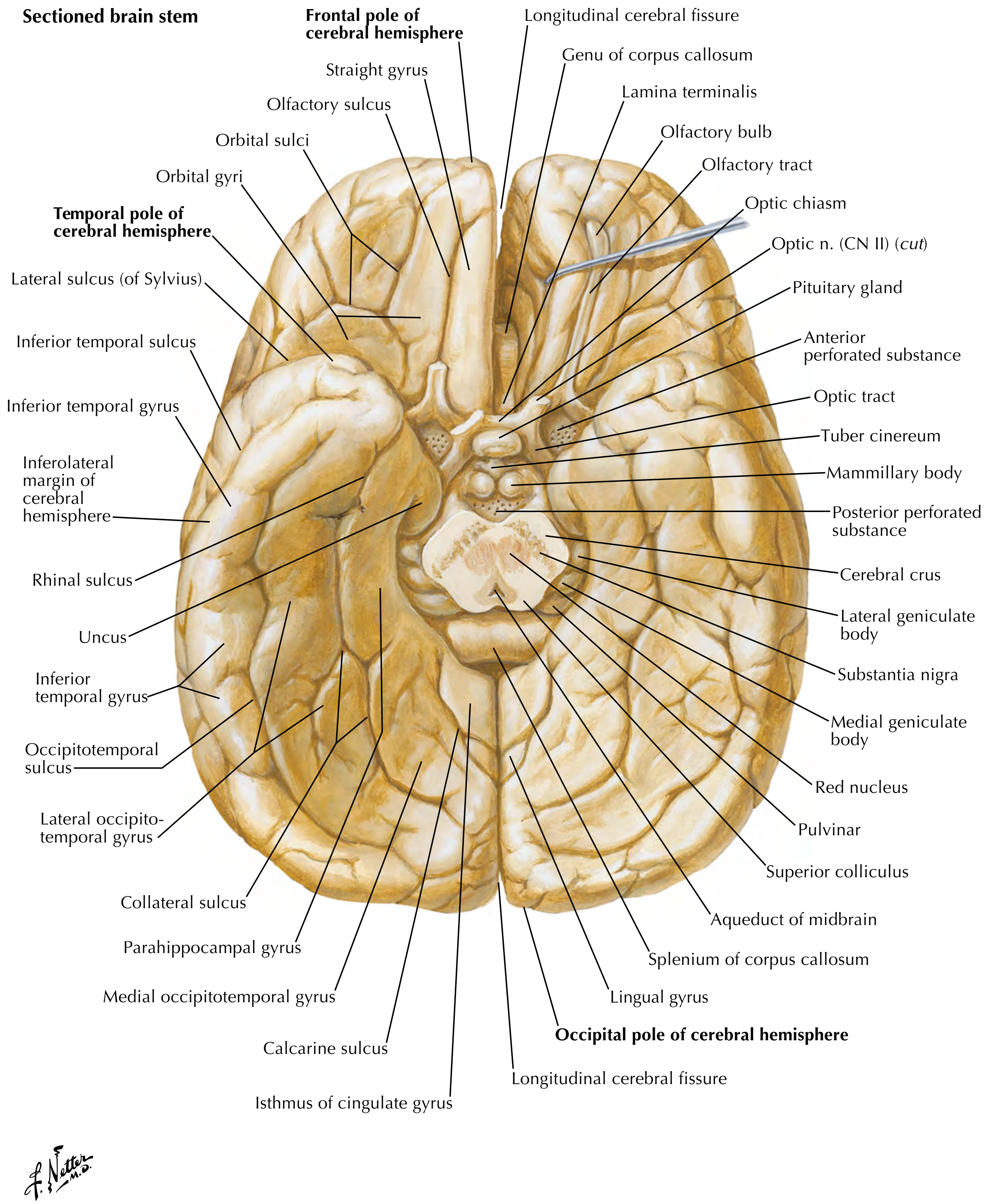

Paracentral sulcus
Cingulate gyrus
Central sulcus (of Rolando)
Cingulate sulcus
Paracentral lobule
Medial frontal gyrus
Marginal sulcus
Sulcus of corpus callosum
Corpus callosum
Fornix
Precuneus
Septum pellucidum
Superior sagittal sinus
Interventricular foramen (of Monro)
Choroid plexus of third ventricle
Interthalamic adhesion
Stria medullaris of thalamus
Thalamus
Parietooccipital sulcus
Third ventricle
Subcallosal area
Cuneus
Anterior commissure
Habenular commissure
Paraolfactory gyri
Pineal gland
Calcarine sulcus
Hypothalamic sulcus
Straight sinus
Lamina terminalis
Great cerebral v. (of Galen)
Posterior commissure
Superior colliculus
Inferior colliculus
Supraoptic recess
Tectal plate
Optic chiasm
Tuber cinereum
Cerebellum
Pituitary gland
Superior medullary velum
Mammillary body
Fourth ventricle
Tegmentum of midbrain
Choroid plexus of fourth ventricle
Inferior medullary velum
Pons
Aqueduct of midbrain (of Sylvius)
Medulla oblongata

Medial surface of cerebral hemisphere: brain stem excised


Genu
Rostrum
Trunk
Splenium
Corpus callosum
Cingulate gyrus
Isthmus of cingulate gyrus
Mammillothalamic fasciculus
Parietooccipital sulcus
Mammillary body
Cuneus
Uncus
Calcarine sulcus
Optic n. (CN II)
Lingual gyrus
Olfactory tract
Crus
Body
Column
Fornix
Collateral sulcus
Rhinal sulcus
Fimbria of hippocampus
Lateral occipitotemporal gyrus
Occipitotemporal sulcus
Dentate gyrus
Inferior temporal gyrus
Parahippocampal gyrus

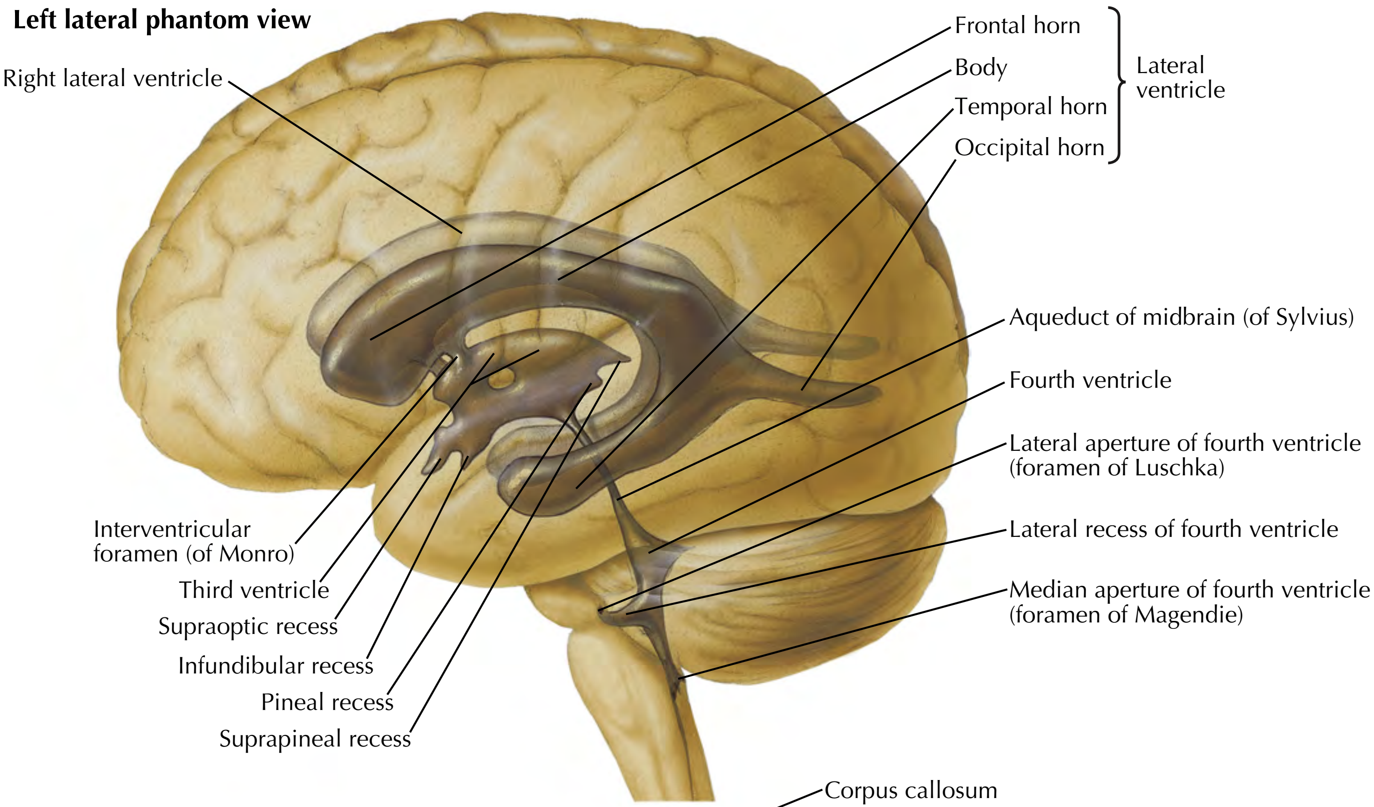
Brain: Inferior View

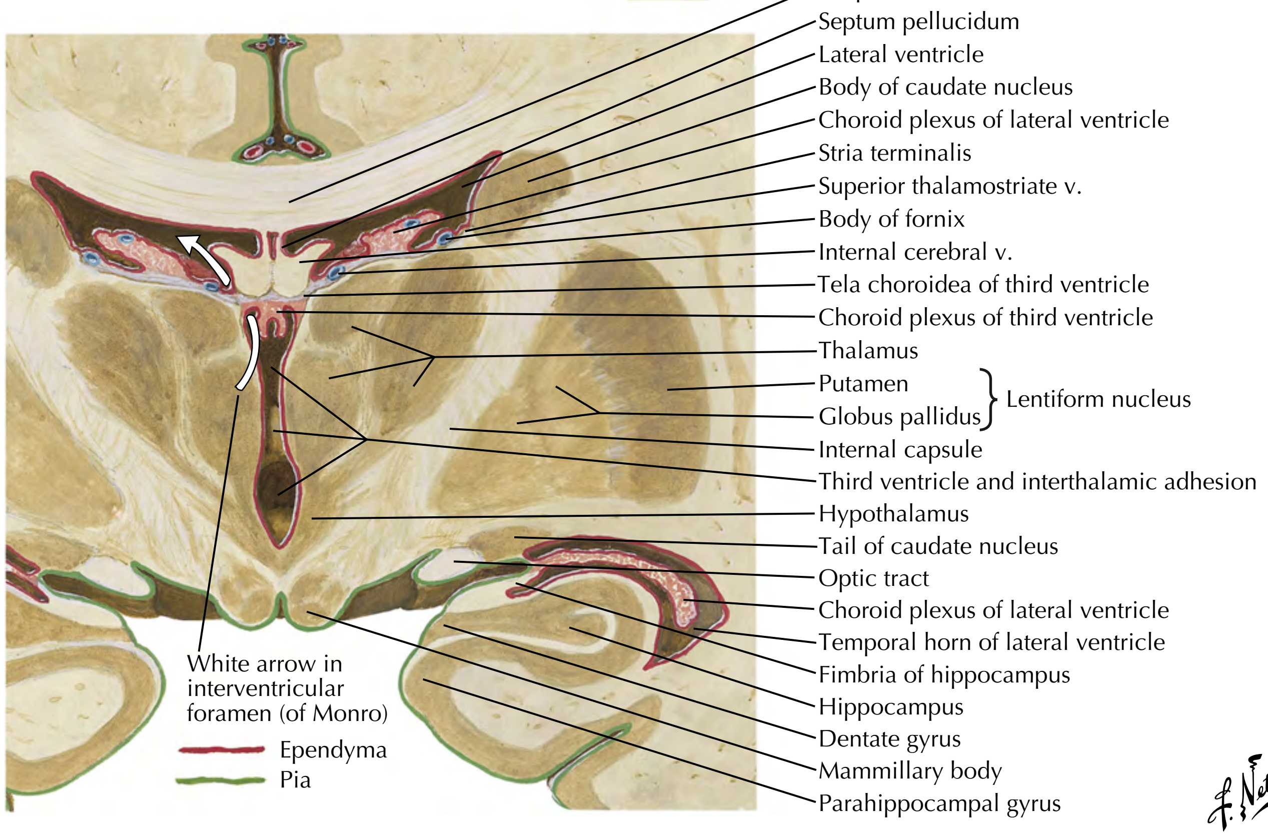
See also **Plate 133**


Sectioned brain stem
Frontal pole of cerebral hemisphere
Longitudinal cerebral fissure
Genu of corpus callosum
Straight gyrus
Lamina terminalis
Olfactory sulcus
Olfactory bulb
Orbital sulci
Olfactory tract
Orbital gyri
Optic chiasm
Temporal pole of cerebral hemisphere
Optic n. (CN II) (*cut*)
Lateral sulcus (of Sylvius)
Pituitary gland
Inferior temporal sulcus
Anterior perforated substance
Optic tract
Inferior temporal gyrus
Tuber cinereum
Inferolateral margin of cerebral hemisphere
Mammillary body
Posterior perforated substance
Rhinal sulcus
Cerebral crus
Uncus
Lateral geniculate body
Substantia nigra
Inferior temporal gyrus
Medial geniculate body
Occipitotemporal sulcus
Red nucleus
Lateral occipito-temporal gyrus
Pulvinar
Superior colliculus
Collateral sulcus
Aqueduct of midbrain
Parahippocampal gyrus
Splenium of corpus callosum
Medial occipitotemporal gyrus
Lingual gyrus
Occipital pole of cerebral hemisphere
Calcarine sulcus
Longitudinal cerebral fissure
Isthmus of cingulate gyrus
F. Netter M.D.

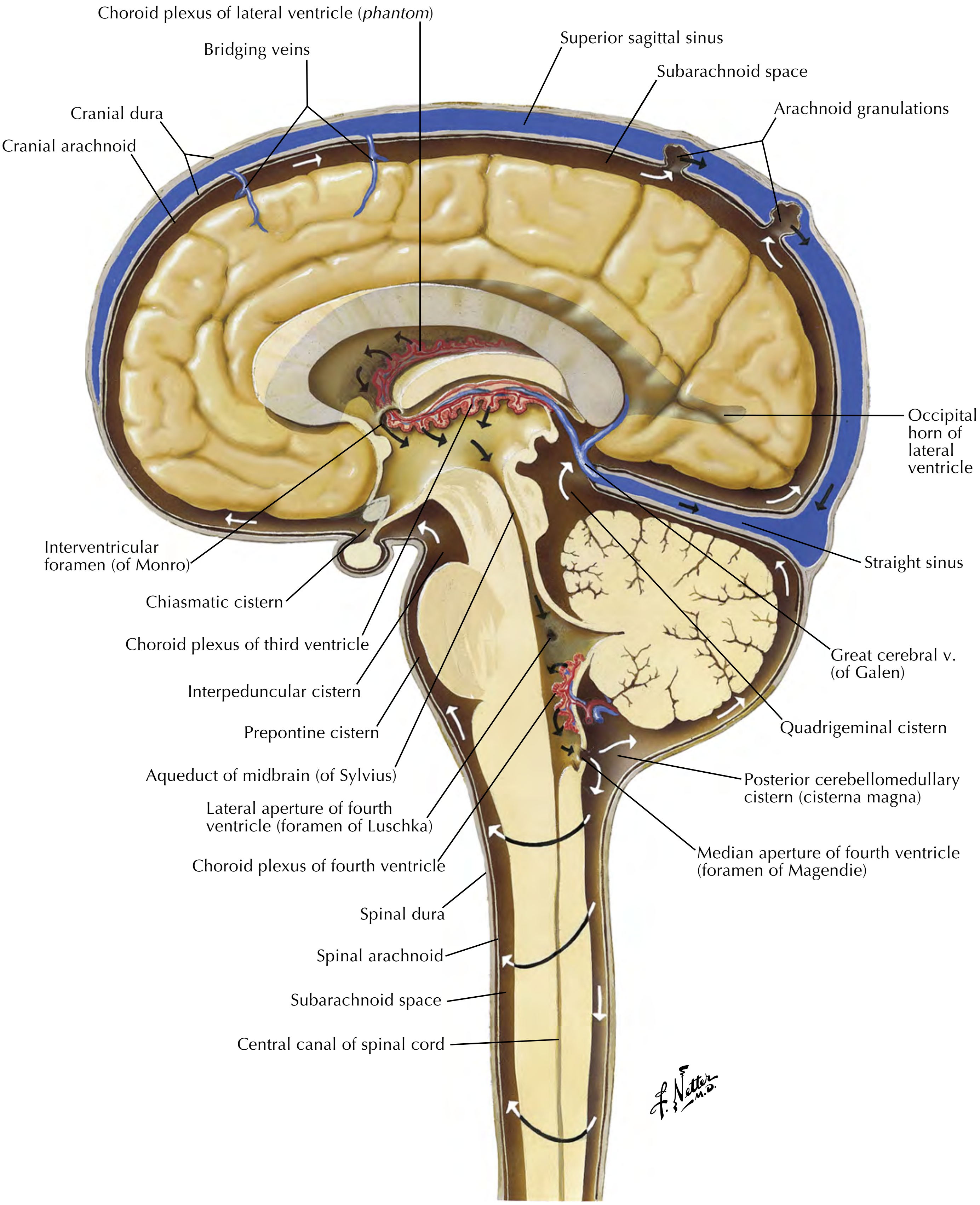
Ventricles of Brain

Left lateral phantom view


Right lateral ventricle
Frontal horn
Body
Temporal horn
Occipital horn
Lateral ventricle
Aqueduct of midbrain (of Sylvius)
Fourth ventricle
Lateral aperture of fourth ventricle (foramen of Luschka)
Lateral recess of fourth ventricle
Median aperture of fourth ventricle (foramen of Magendie)
Interventricular foramen (of Monro)
Third ventricle
Supraoptic recess
Infundibular recess
Pineal recess
Suprapineal recess


Corpus callosum
Septum pellucidum
Lateral ventricle
Body of caudate nucleus
Choroid plexus of lateral ventricle
Stria terminalis
Superior thalamostriate v.
Body of fornix
Internal cerebral v.
Tela choroidea of third ventricle
Choroid plexus of third ventricle
Thalamus
Putamen
Globus pallidus
Lentiform nucleus
Internal capsule
Third ventricle and interthalamic adhesion
Hypothalamus
Tail of caudate nucleus
Optic tract
Choroid plexus of lateral ventricle
Temporal horn of lateral ventricle
Fimbria of hippocampus
Hippocampus
Dentate gyrus
Mammillary body
Parahippocampal gyrus
White arrow in interventricular foramen (of Monro)
Ependyma
Pia

Coronal section of brain: posterior view


Choroid plexus of lateral ventricle (*phantom*)
Bridging veins
Cranial dura
Cranial arachnoid
Superior sagittal sinus
Subarachnoid space
Arachnoid granulations
Occipital horn of lateral ventricle
Straight sinus
Great cerebral v. (of Galen)
Quadrigeminal cistern
Posterior cerebellomedullary cistern (cisterna magna)
Median aperture of fourth ventricle (foramen of Magendie)
Interventricular foramen (of Monro)
Chiasmatic cistern
Choroid plexus of third ventricle
Interpeduncular cistern
Prepontine cistern
Aqueduct of midbrain (of Sylvius)
Lateral aperture of fourth ventricle (foramen of Luschka)
Choroid plexus of fourth ventricle
Spinal dura
Spinal arachnoid
Subarachnoid space
Central canal of spinal cord
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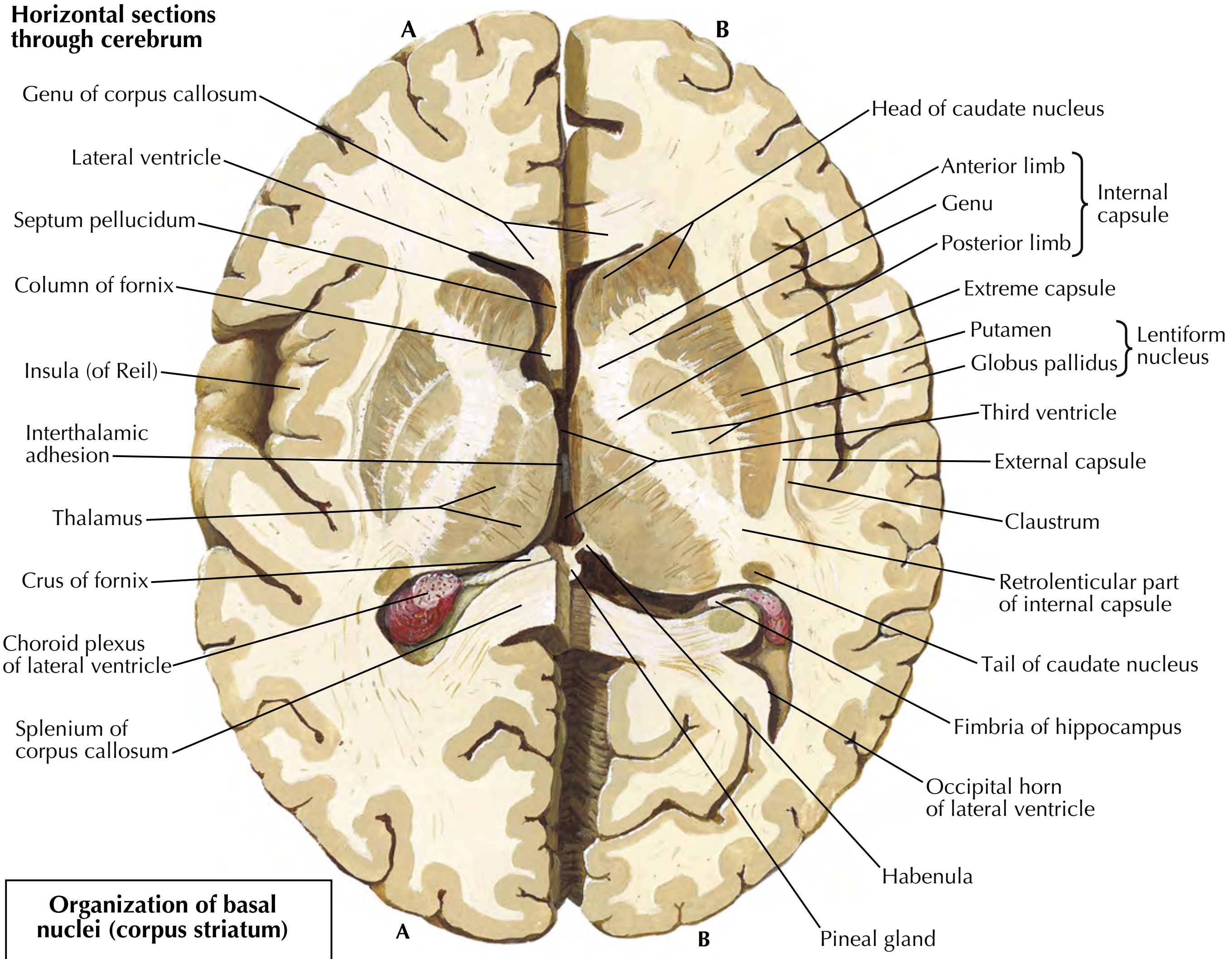
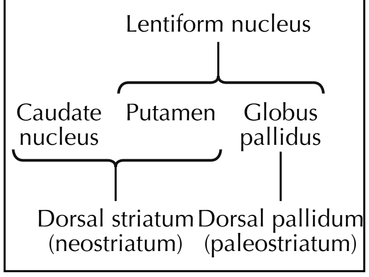
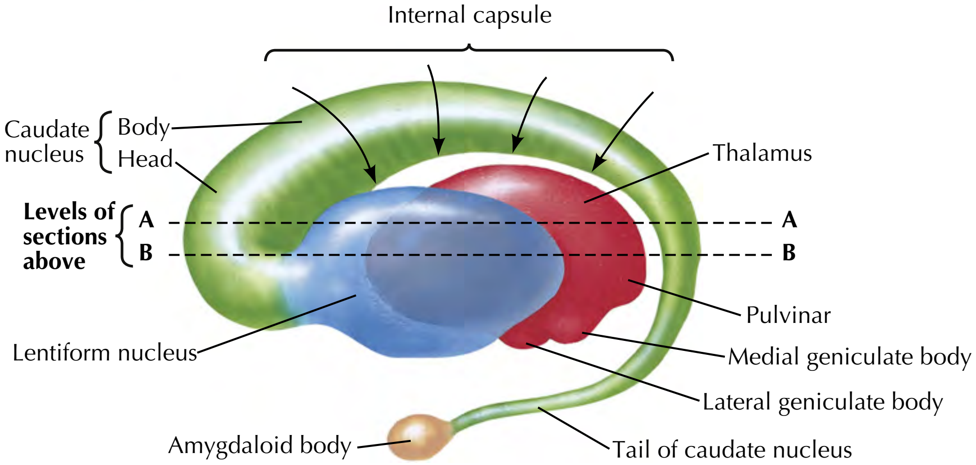
Basal Nuclei

Horizontal sections through cerebrum

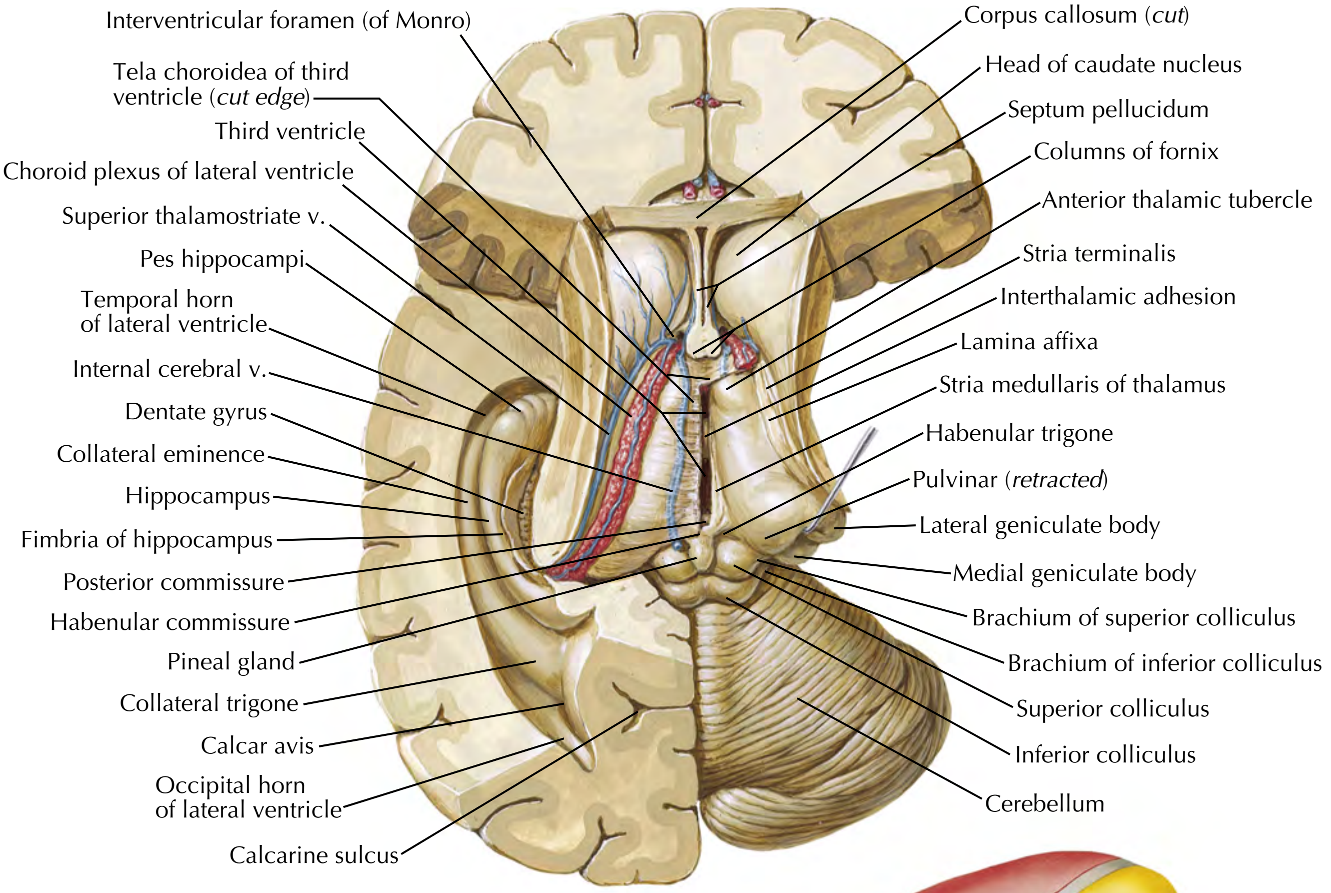

A
B
Genu of corpus callosum
Lateral ventricle
Septum pellucidum
Column of fornix
Insula (of Reil)
Interthalamic adhesion
Thalamus
Crus of fornix
Choroid plexus of lateral ventricle
Splenium of corpus callosum
Head of caudate nucleus
Anterior limb
Genu
Posterior limb
Internal capsule
Extreme capsule
Putamen
Globus pallidus
Lentiform nucleus
Third ventricle
External capsule
Claustrum
Retrolenticular part of internal capsule
Tail of caudate nucleus
Fimbria of hippocampus
Occipital horn of lateral ventricle
Habenula
Pineal gland
A
B

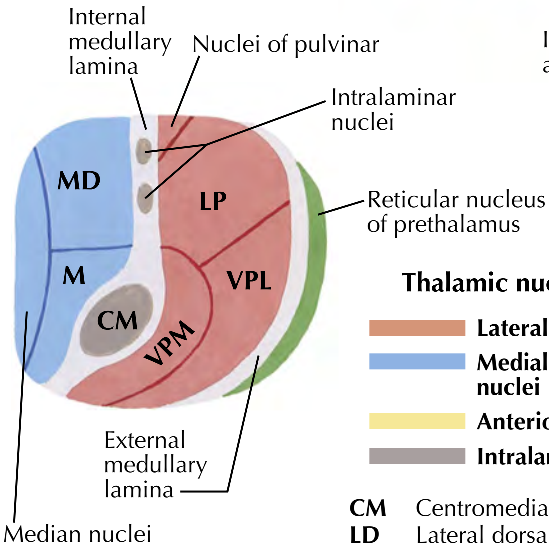
Organization of basal nuclei (corpus striatum)


Lentiform nucleus
Caudate nucleus
Putamen
Globus pallidus
Dorsal striatum (neostriatum)
Dorsal pallidum (paleostriatum)


Internal capsule
Caudate nucleus
Body
Head
Thalamus
Levels of sections above
A
B
A
B
Pulvinar
Medial geniculate body
Lateral geniculate body
Lentiform nucleus
Amygdaloid body
Tail of caudate nucleus

Interrelationship of thalamus, lentiform nucleus, caudate nucleus, and amygdaloid body (schema): left lateral view


Interventricular foramen (of Monro)
Tela choroidea of third ventricle (*cut edge*)
Third ventricle
Choroid plexus of lateral ventricle
Superior thalamostriate v.
Pes hippocampi
Temporal horn of lateral ventricle
Internal cerebral v.
Dentate gyrus
Collateral eminence
Hippocampus
Fimbria of hippocampus
Posterior commissure
Habenular commissure
Pineal gland
Collateral trigone
Calcar avis
Occipital horn of lateral ventricle
Calcarine sulcus
Corpus callosum (*cut*)
Head of caudate nucleus
Septum pellucidum
Columns of fornix
Anterior thalamic tubercle
Stria terminalis
Interthalamic adhesion
Lamina affixa
Stria medullaris of thalamus
Habenular trigone
Pulvinar (*retracted*)
Lateral geniculate body
Medial geniculate body
Brachium of superior colliculus
Brachium of inferior colliculus
Superior colliculus
Inferior colliculus
Cerebellum

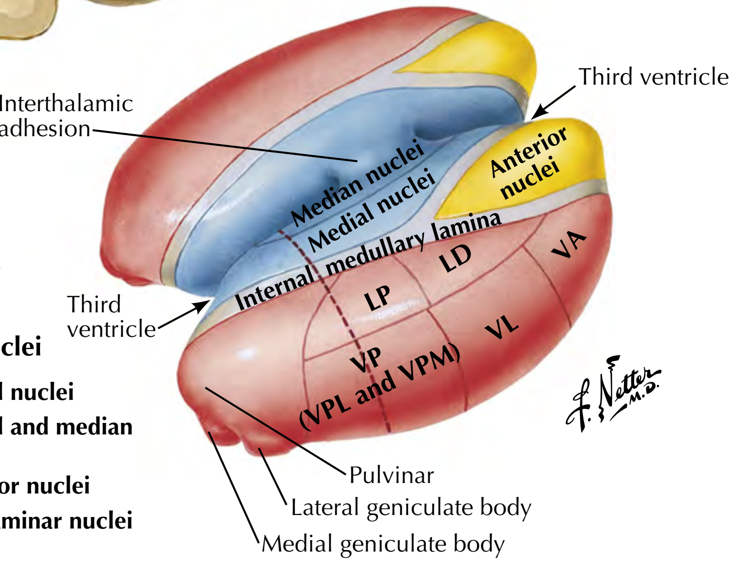

Internal medullary lamina
Nuclei of pulvinar
Intralaminar nuclei
MD
LP
Reticular nucleus of prethalamus
M
VPL
CM
VPM
External medullary lamina
Median nuclei

Schematic section through thalamus
(at level of broken line shown in figure at right)

Thalamic nuclei

- 🟥 **Lateral nuclei**
- 🟦 **Medial and median nuclei**
- 🟨 **Anterior nuclei**
- ⬜ **Intralaminar nuclei**

CM	Centromedian nucleus
LD	Lateral dorsal nucleus
LP	Lateral posterior nucleus
M	Medial nuclei
MD	Medial dorsal nucleus
VA	Ventral anterior nucleus
VL	Ventral lateral nuclei
VP	Ventral posterior nuclei
VPL	Ventral posterolateral nucleus
VPM	Ventral posteromedial nucleus


Third ventricle
Interthalamic adhesion
Median nuclei
Medial nuclei
Anterior nuclei
Internal medullary lamina
LD
VA
LP
VL
VP (VPL and VPM)
Third ventricle
Pulvinar
Lateral geniculate body
Medial geniculate body
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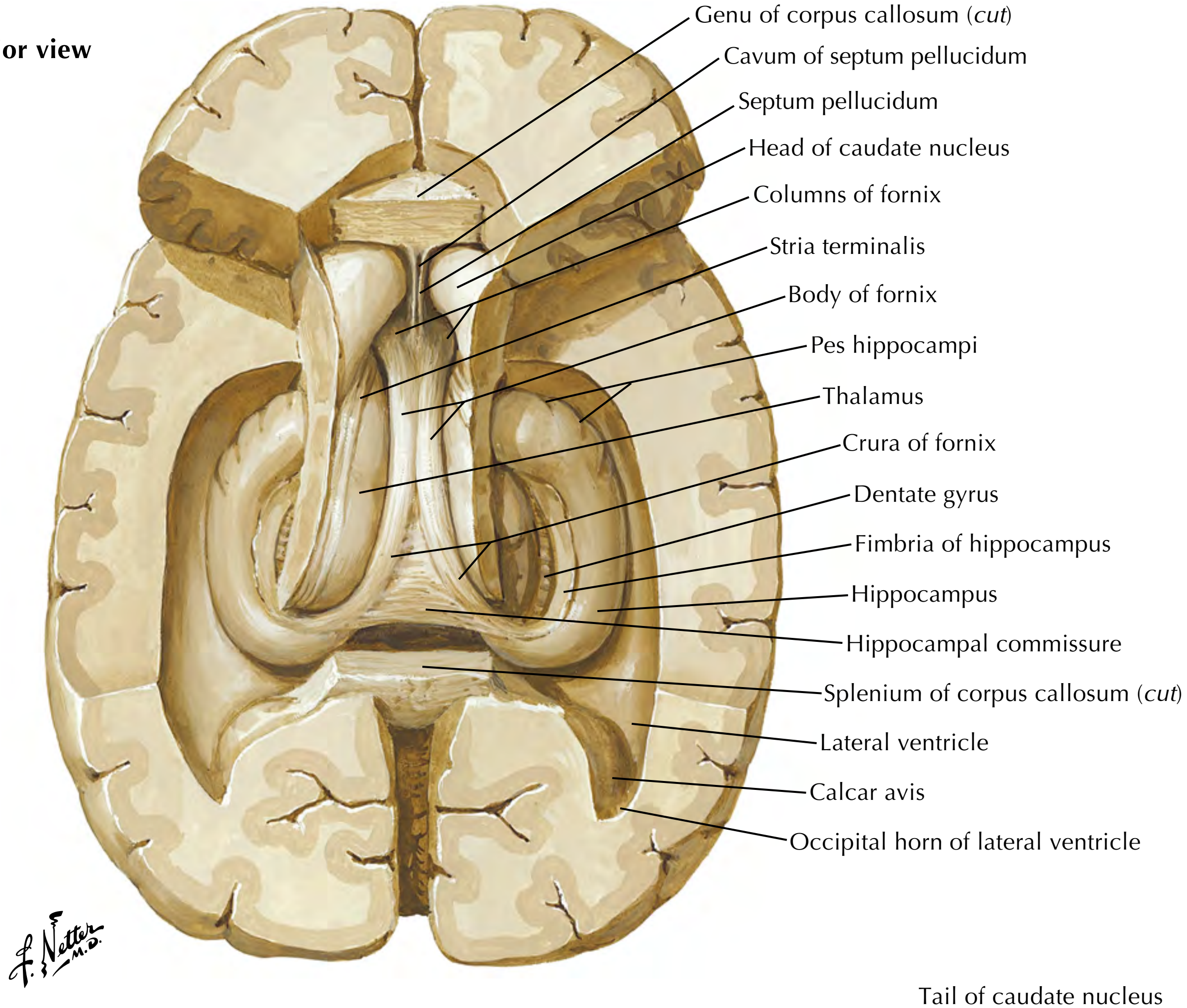
Schematic representation of thalamus
(external medullary lamina and reticular nucleus removed)

Hippocampus and Fornix

Superior view


Genu of corpus callosum (*cut*)
Cavum of septum pellucidum
Septum pellucidum
Head of caudate nucleus
Columns of fornix
Stria terminalis
Body of fornix
Pes hippocampi
Thalamus
Crura of fornix
Dentate gyrus
Fimbria of hippocampus
Hippocampus
Hippocampal commissure
Splenium of corpus callosum (*cut*)
Lateral ventricle
Calcar avis
Occipital horn of lateral ventricle
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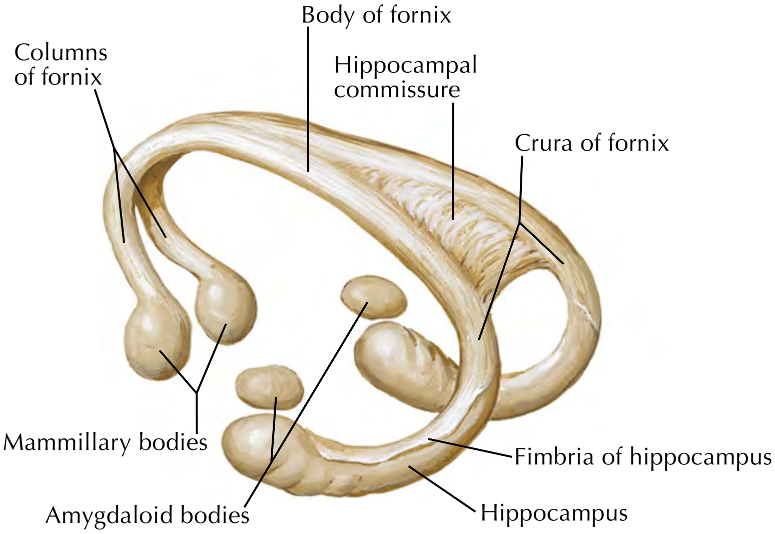
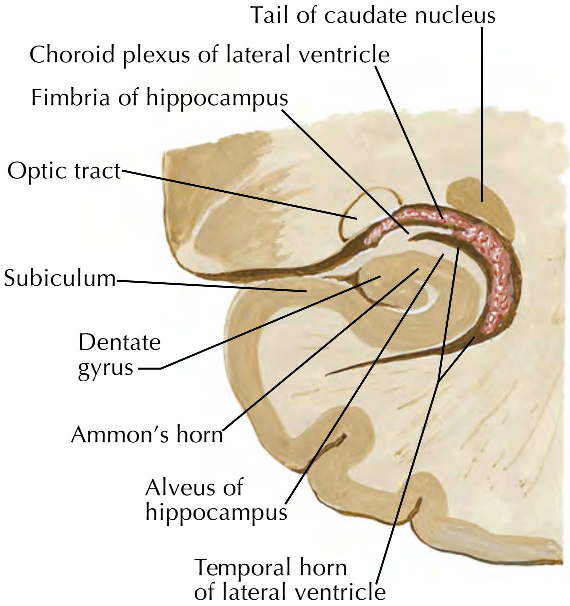
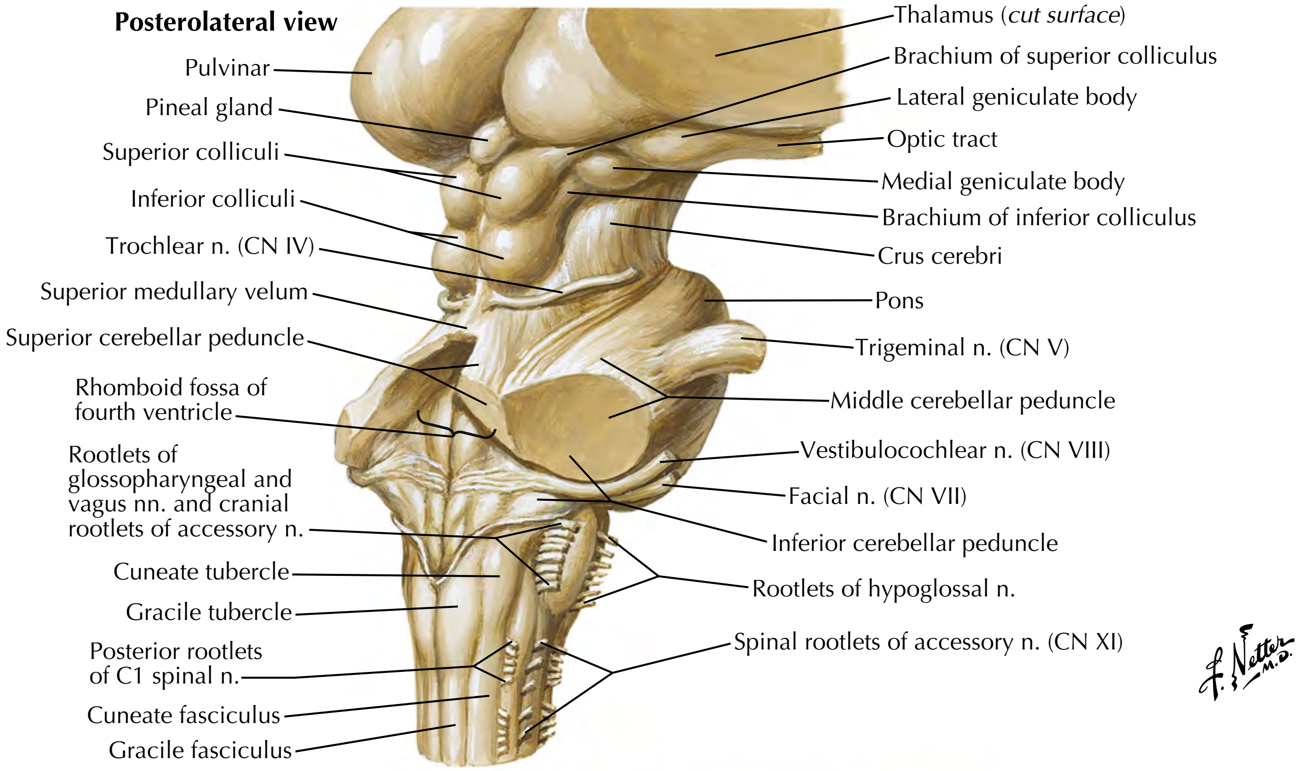

Body of fornix
Columns of fornix
Hippocampal commissure
Crura of fornix
Mammillary bodies
Fimbria of hippocampus
Amygdaloid bodies
Hippocampus

Fornix: schema


Tail of caudate nucleus
Choroid plexus of lateral ventricle
Fimbria of hippocampus
Optic tract
Subiculum
Dentate gyrus
Ammon's horn
Alveus of hippocampus
Temporal horn of lateral ventricle

Coronal section: posterior view

Posterolateral view


Pulvinar
Pineal gland
Superior colliculi
Inferior colliculi
Trochlear n. (CN IV)
Superior medullary velum
Superior cerebellar peduncle
Rhomboid fossa of fourth ventricle
Rootlets of glossopharyngeal and vagus nn. and cranial rootlets of accessory n.
Cuneate tubercle
Gracile tubercle
Posterior rootlets of C1 spinal n.
Cuneate fasciculus
Gracile fasciculus
Thalamus (*cut surface*)
Brachium of superior colliculus
Lateral geniculate body
Optic tract
Medial geniculate body
Brachium of inferior colliculus
Crus cerebri
Pons
Trigeminal n. (CN V)
Middle cerebellar peduncle
Vestibulocochlear n. (CN VIII)
Facial n. (CN VII)
Inferior cerebellar peduncle
Rootlets of hypoglossal n.
Spinal rootlets of accessory n. (CN XI)
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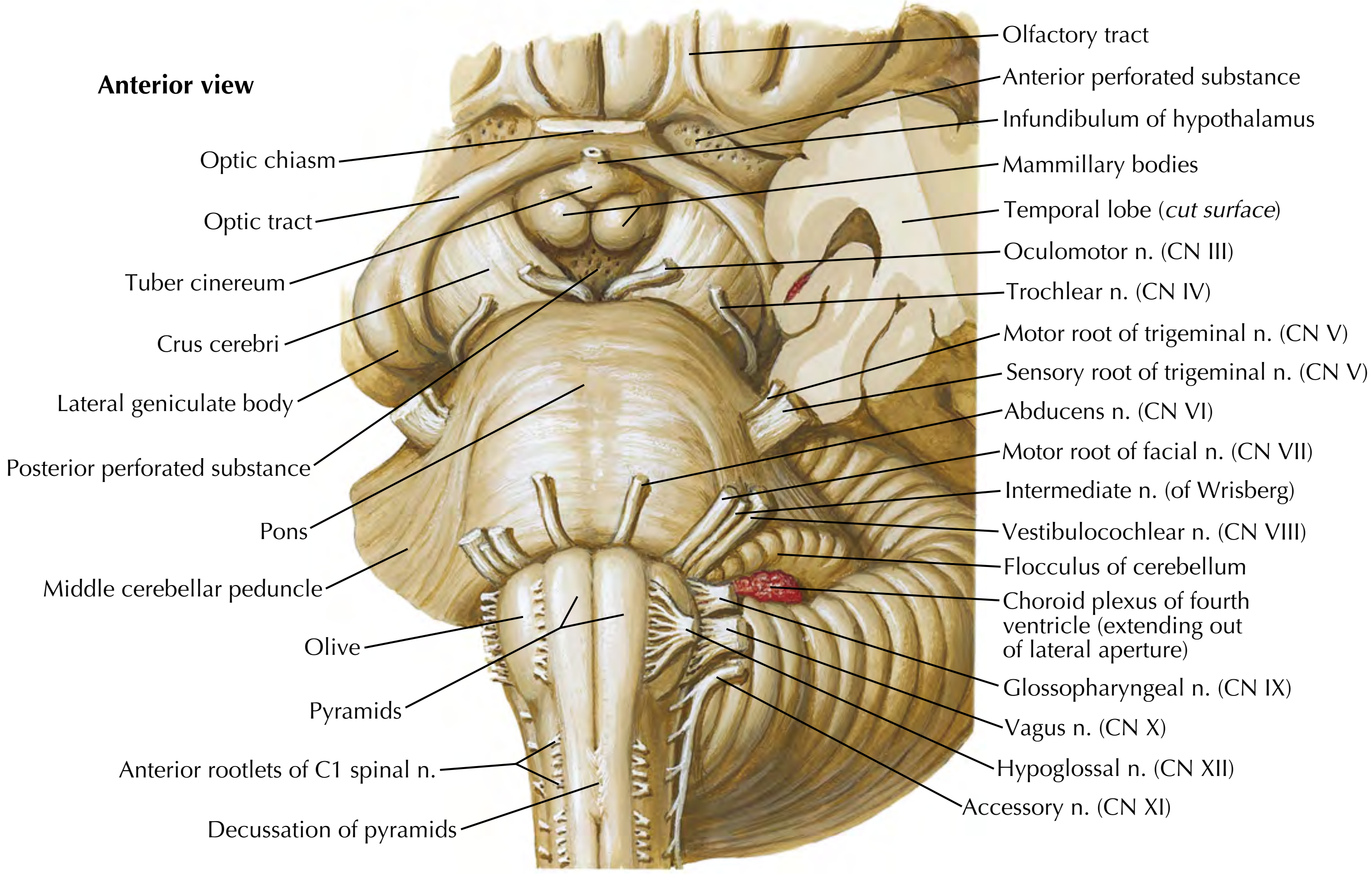
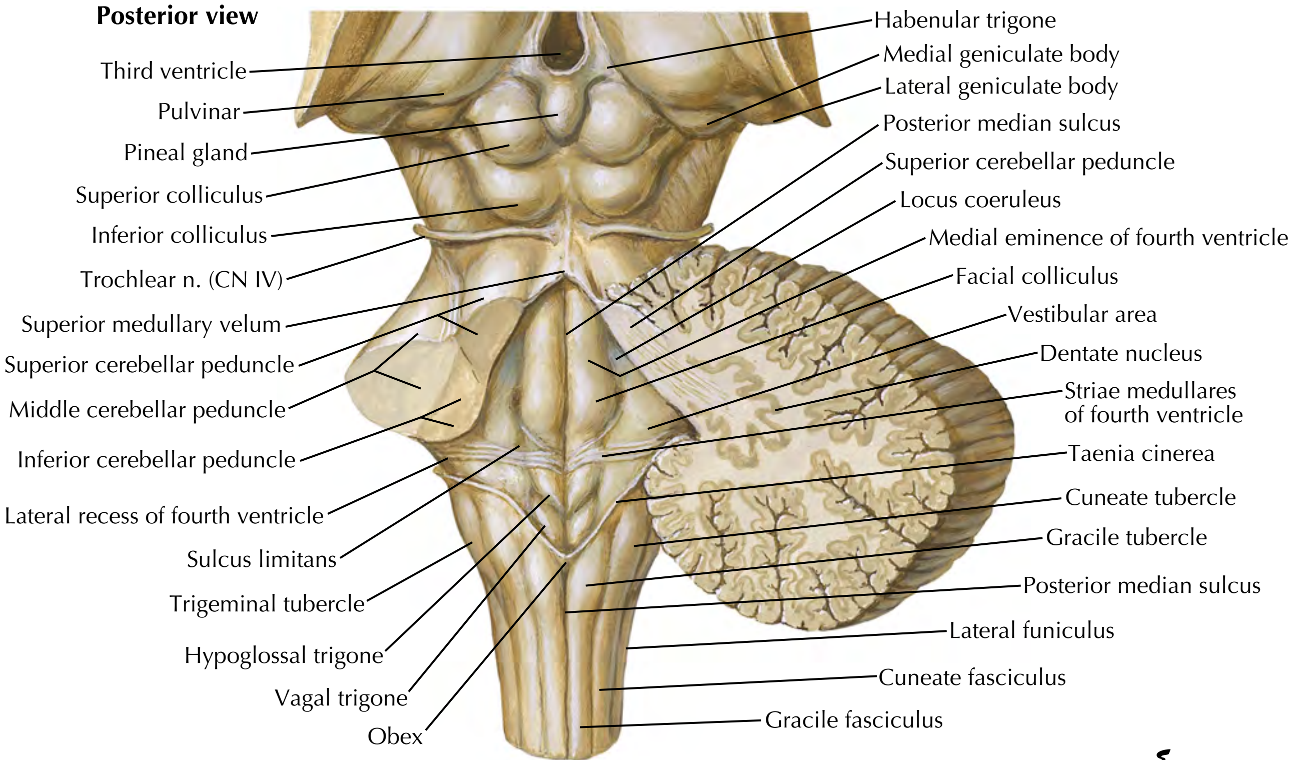
Anterior view

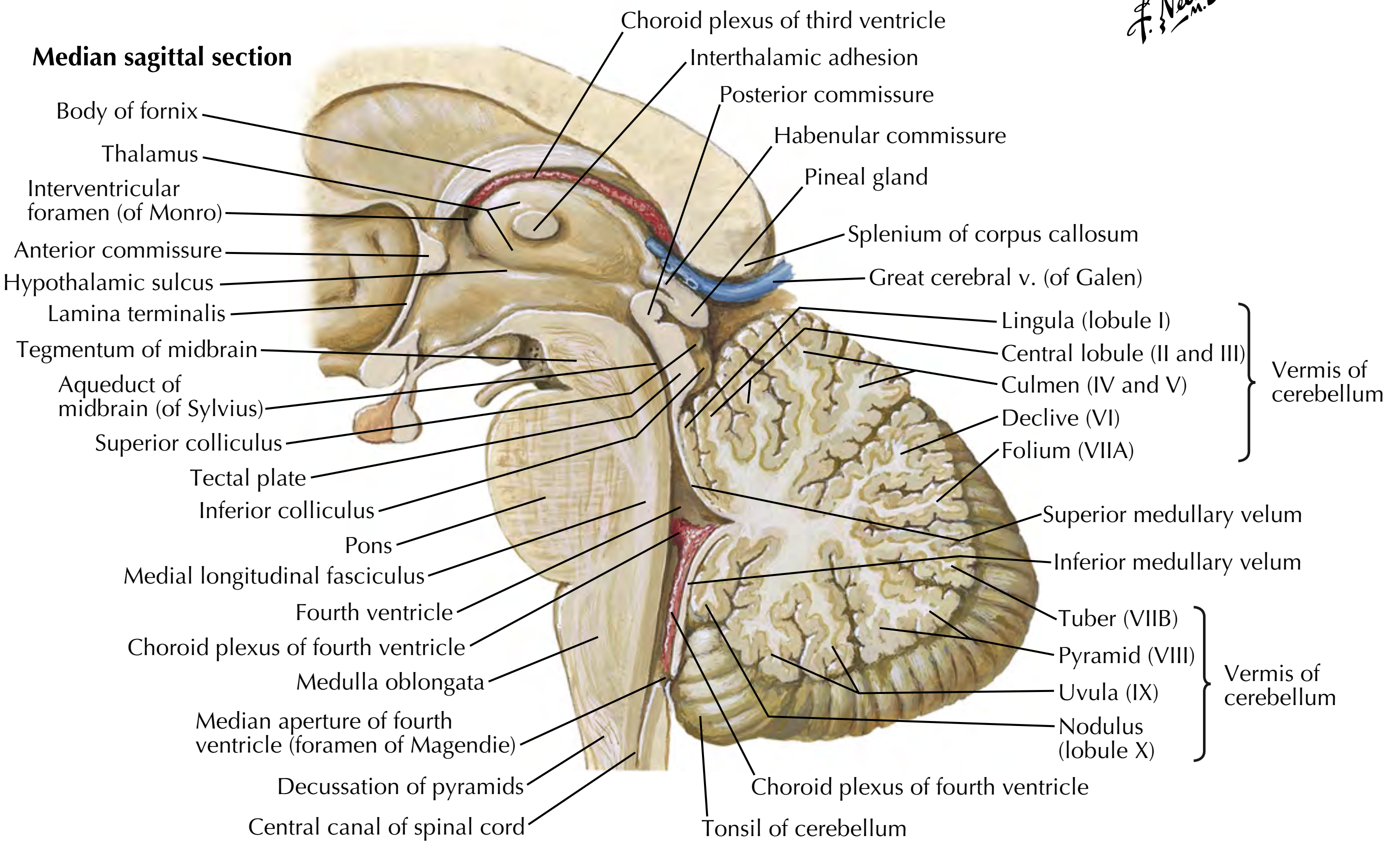

Optic chiasm
Optic tract
Tuber cinereum
Crus cerebri
Lateral geniculate body
Posterior perforated substance
Pons
Middle cerebellar peduncle
Olive
Pyramids
Anterior rootlets of C1 spinal n.
Decussation of pyramids
Olfactory tract
Anterior perforated substance
Infundibulum of hypothalamus
Mammillary bodies
Temporal lobe (*cut surface*)
Oculomotor n. (CN III)
Trochlear n. (CN IV)
Motor root of trigeminal n. (CN V)
Sensory root of trigeminal n. (CN V)
Abducens n. (CN VI)
Motor root of facial n. (CN VII)
Intermediate n. (of Wrisberg)
Vestibulocochlear n. (CN VIII)
Flocculus of cerebellum
Choroid plexus of fourth ventricle (extending out of lateral aperture)
Glossopharyngeal n. (CN IX)
Vagus n. (CN X)
Hypoglossal n. (CN XII)
Accessory n. (CN XI)

Ventricles and Cerebellum

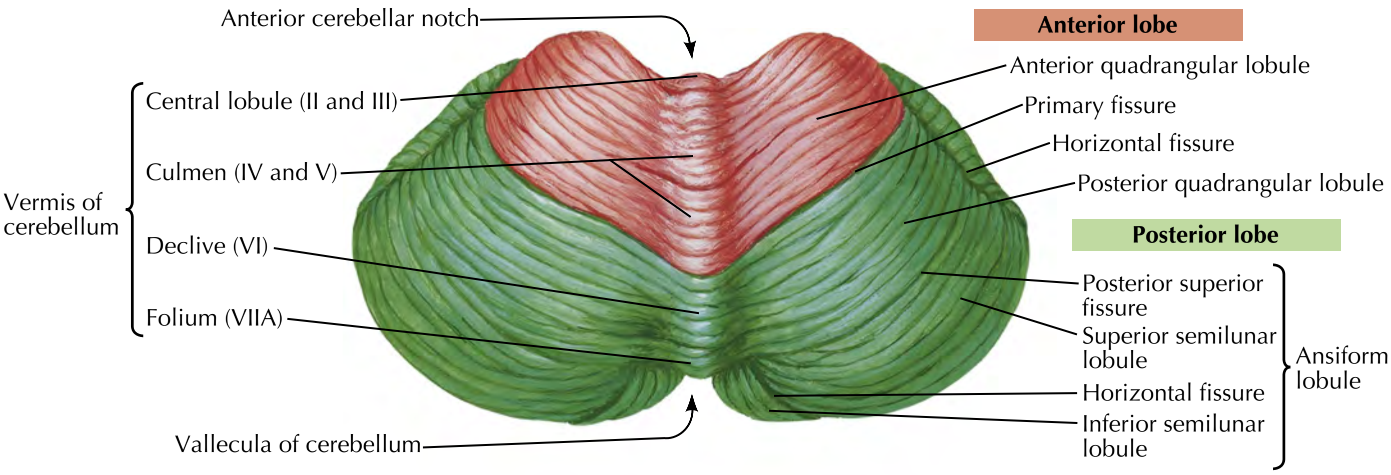
Posterior view


Third ventricle
Pulvinar
Pineal gland
Superior colliculus
Inferior colliculus
Trochlear n. (CN IV)
Superior medullary velum
Superior cerebellar peduncle
Middle cerebellar peduncle
Inferior cerebellar peduncle
Lateral recess of fourth ventricle
Sulcus limitans
Trigeminal tubercle
Hypoglossal trigone
Vagal trigone
Obex
Habenular trigone
Medial geniculate body
Lateral geniculate body
Posterior median sulcus
Superior cerebellar peduncle
Locus coeruleus
Medial eminence of fourth ventricle
Facial colliculus
Vestibular area
Dentate nucleus
Striae medullares of fourth ventricle
Taenia cinerea
Cuneate tubercle
Gracile tubercle
Posterior median sulcus
Lateral funiculus
Cuneate fasciculus
Gracile fasciculus

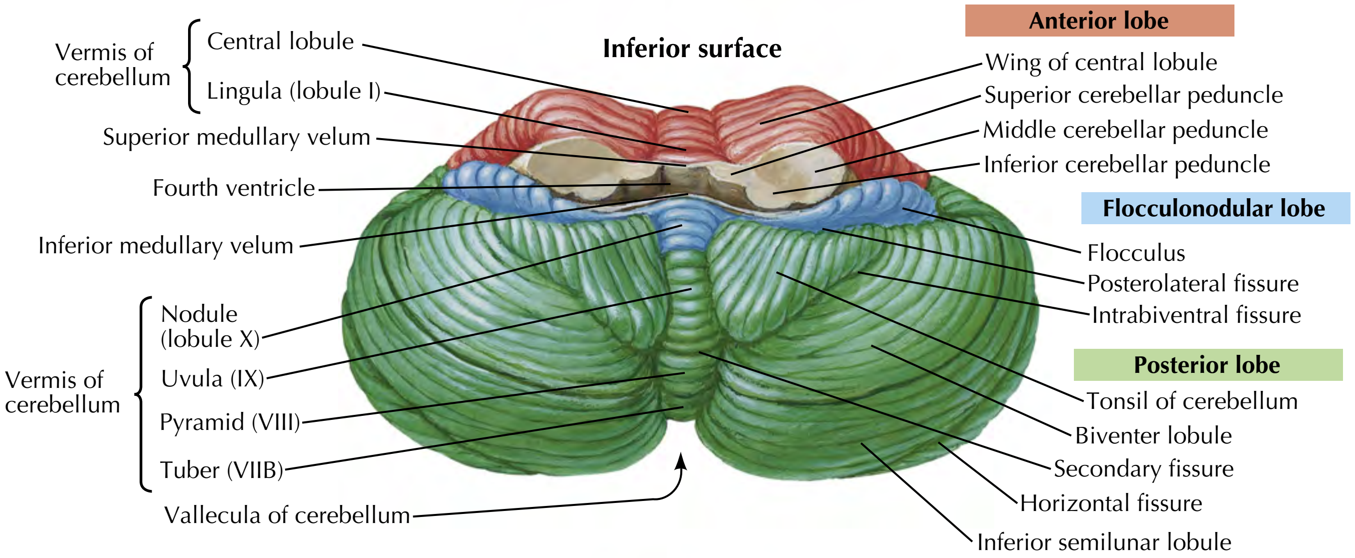
Median sagittal section

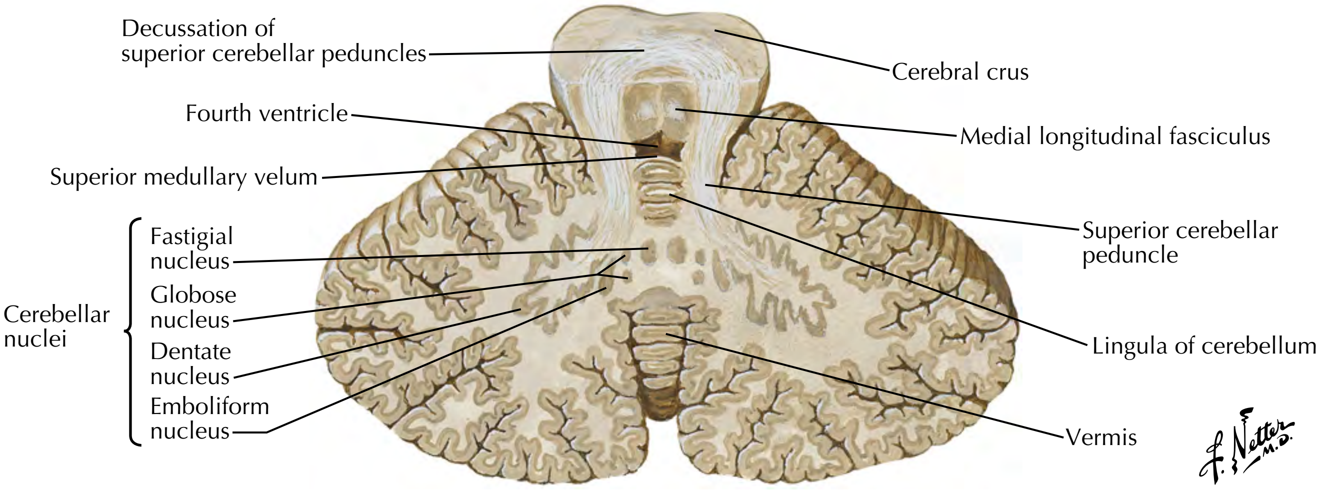

Body of fornix
Thalamus
Interventricular foramen (of Monro)
Anterior commissure
Hypothalamic sulcus
Lamina terminalis
Tegmentum of midbrain
Aqueduct of midbrain (of Sylvius)
Superior colliculus
Tectal plate
Inferior colliculus
Pons
Medial longitudinal fasciculus
Fourth ventricle
Choroid plexus of fourth ventricle
Medulla oblongata
Median aperture of fourth ventricle (foramen of Magendie)
Decussation of pyramids
Central canal of spinal cord
Choroid plexus of third ventricle
Interthalamic adhesion
Posterior commissure
Habenular commissure
Pineal gland
Splenium of corpus callosum
Great cerebral v. (of Galen)
Lingula (lobule I)
Central lobule (II and III)
Culmen (IV and V)
Declive (VI)
Folium (VIIA)
Vermis of cerebellum
Superior medullary velum
Inferior medullary velum
Tuber (VIIB)
Pyramid (VIII)
Uvula (IX)
Nodulus (lobule X)
Vermis of cerebellum
Choroid plexus of fourth ventricle
Tonsil of cerebellum

Superior surface


Anterior cerebellar notch
Anterior lobe
Anterior quadrangular lobule
Primary fissure
Horizontal fissure
Posterior quadrangular lobule
Posterior lobe
Vermis of cerebellum
Central lobule (II and III)
Culmen (IV and V)
Declive (VI)
Folium (VIIA)
Posterior superior fissure
Superior semilunar lobule
Horizontal fissure
Inferior semilunar lobule
Ansiform lobule
Vallecula of cerebellum

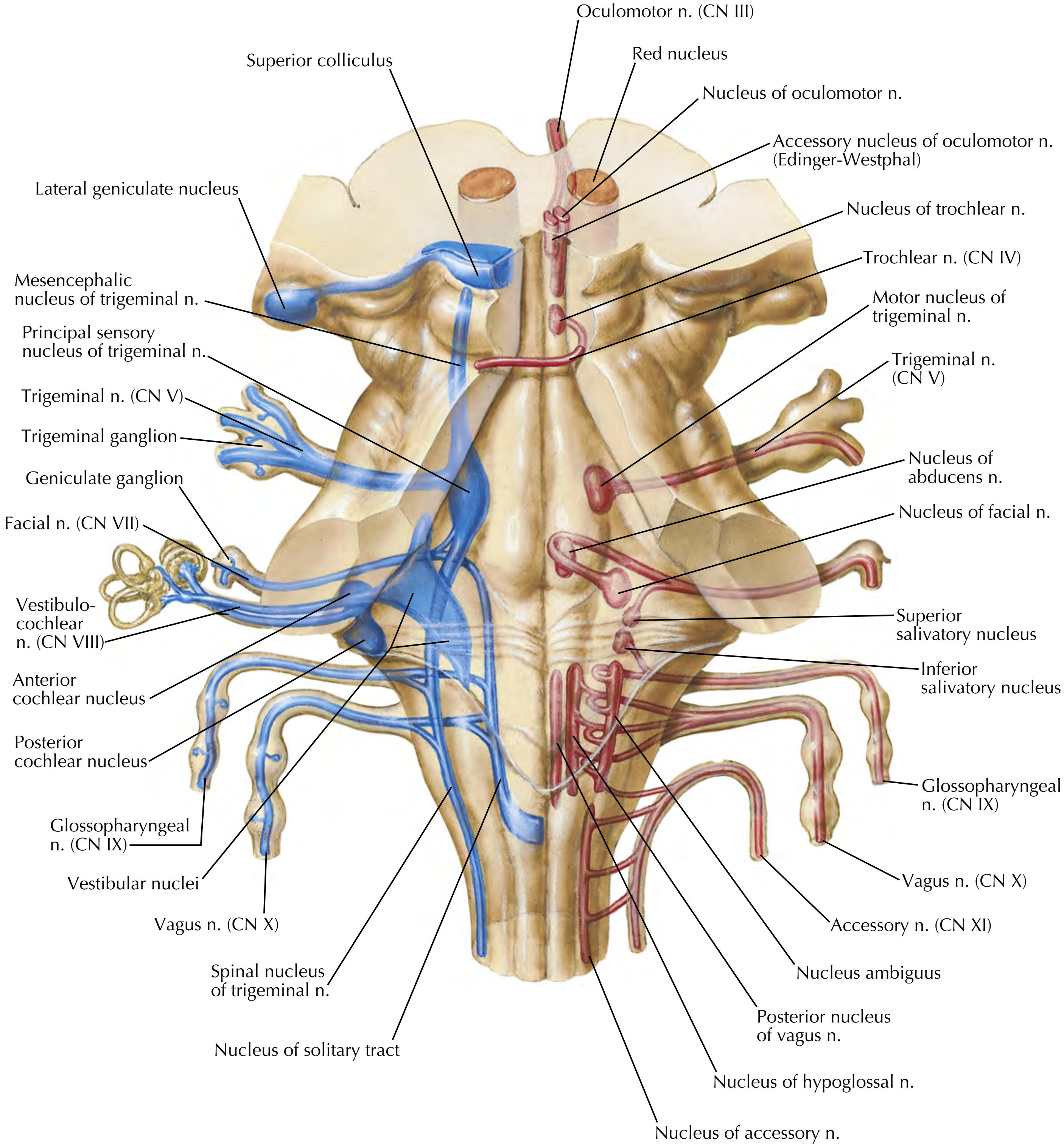
Inferior surface


Vermis of cerebellum
Central lobule
Lingula (lobule I)
Anterior lobe
Wing of central lobule
Superior cerebellar peduncle
Middle cerebellar peduncle
Inferior cerebellar peduncle
Superior medullary velum
Fourth ventricle
Inferior medullary velum
Flocculonodular lobe
Flocculus
Posterolateral fissure
Intrabiventral fissure
Vermis of cerebellum
Nodule (lobule X)
Uvula (IX)
Pyramid (VIII)
Tuber (VIIB)
Posterior lobe
Tonsil of cerebellum
Biventer lobule
Secondary fissure
Horizontal fissure
Inferior semilunar lobule
Vallecula of cerebellum


Decussation of superior cerebellar peduncles
Cerebral crus
Fourth ventricle
Medial longitudinal fasciculus
Superior medullary velum
Superior cerebellar peduncle
Cerebellar nuclei
Fastigial nucleus
Globose nucleus
Dentate nucleus
Emboliform nucleus
Lingula of cerebellum
Vermis
F. Netter M.D.

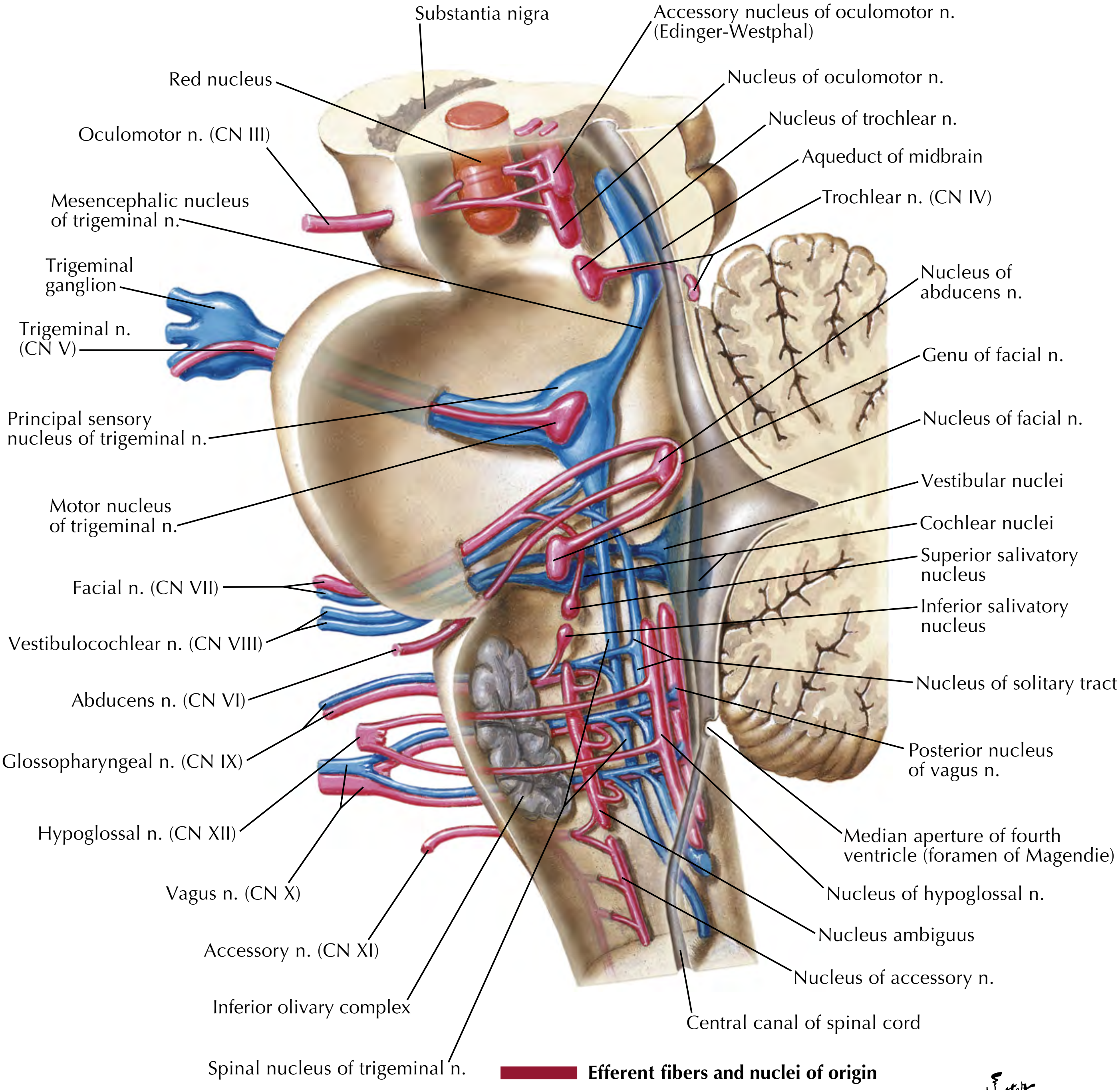
Section in plane of superior cerebellar peduncle

Cranial Nerve Nuclei in Brain Stem: Schema (Posterior View)


Oculomotor n. (CN III)
Superior colliculus
Red nucleus
Nucleus of oculomotor n.
Accessory nucleus of oculomotor n. (Edinger-Westphal)
Lateral geniculate nucleus
Nucleus of trochlear n.
Trochlear n. (CN IV)
Mesencephalic nucleus of trigeminal n.
Motor nucleus of trigeminal n.
Principal sensory nucleus of trigeminal n.
Trigeminal n. (CN V)
Trigeminal n. (CN V)
Trigeminal ganglion
Nucleus of abducens n.
Geniculate ganglion
Nucleus of facial n.
Facial n. (CN VII)
Vestibulo-cochlear n. (CN VIII)
Superior salivatory nucleus
Inferior salivatory nucleus
Anterior cochlear nucleus
Posterior cochlear nucleus
Glossopharyngeal n. (CN IX)
Glossopharyngeal n. (CN IX)
Vestibular nuclei
Vagus n. (CN X)
Vagus n. (CN X)
Accessory n. (CN XI)
Spinal nucleus of trigeminal n.
Nucleus ambiguus
Posterior nucleus of vagus n.
Nucleus of solitary tract
Nucleus of hypoglossal n.
Nucleus of accessory n.

🟥 **Efferent fibers and the nuclei of origin**

🟦 **Afferent fibers and the nuclei of termination**

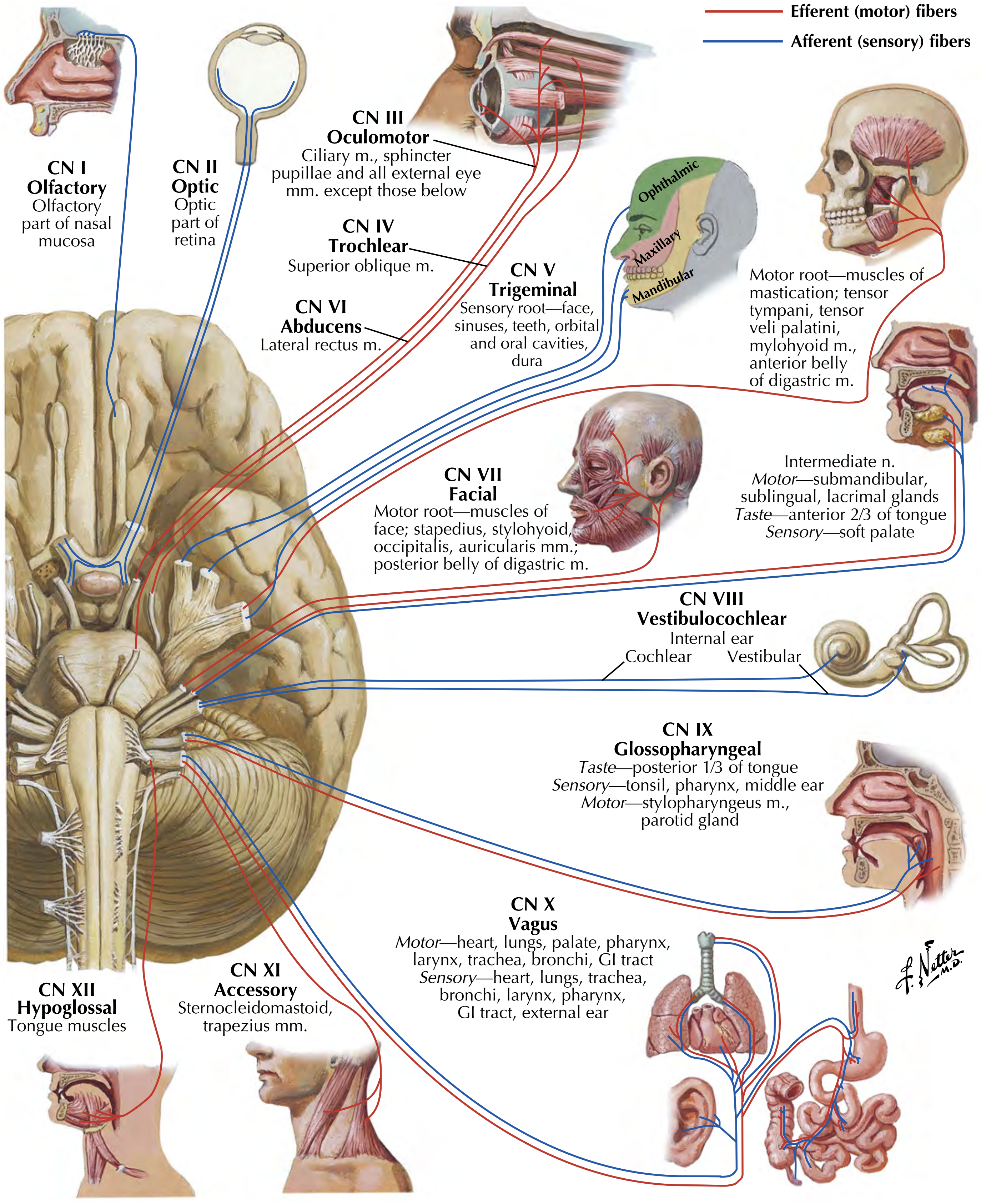

Substantia nigra
Accessory nucleus of oculomotor n. (Edinger-Westphal)
Red nucleus
Nucleus of oculomotor n.
Oculomotor n. (CN III)
Nucleus of trochlear n.
Aqueduct of midbrain
Mesencephalic nucleus of trigeminal n.
Trochlear n. (CN IV)
Trigeminal ganglion
Nucleus of abducens n.
Trigeminal n. (CN V)
Genu of facial n.
Principal sensory nucleus of trigeminal n.
Nucleus of facial n.
Vestibular nuclei
Motor nucleus of trigeminal n.
Cochlear nuclei
Superior salivatory nucleus
Facial n. (CN VII)
Inferior salivatory nucleus
Vestibulocochlear n. (CN VIII)
Nucleus of solitary tract
Abducens n. (CN VI)
Posterior nucleus of vagus n.
Glossopharyngeal n. (CN IX)
Median aperture of fourth ventricle (foramen of Magendie)
Hypoglossal n. (CN XII)
Nucleus of hypoglossal n.
Vagus n. (CN X)
Nucleus ambiguus
Accessory n. (CN XI)
Nucleus of accessory n.
Inferior olivary complex
Central canal of spinal cord
Spinal nucleus of trigeminal n.

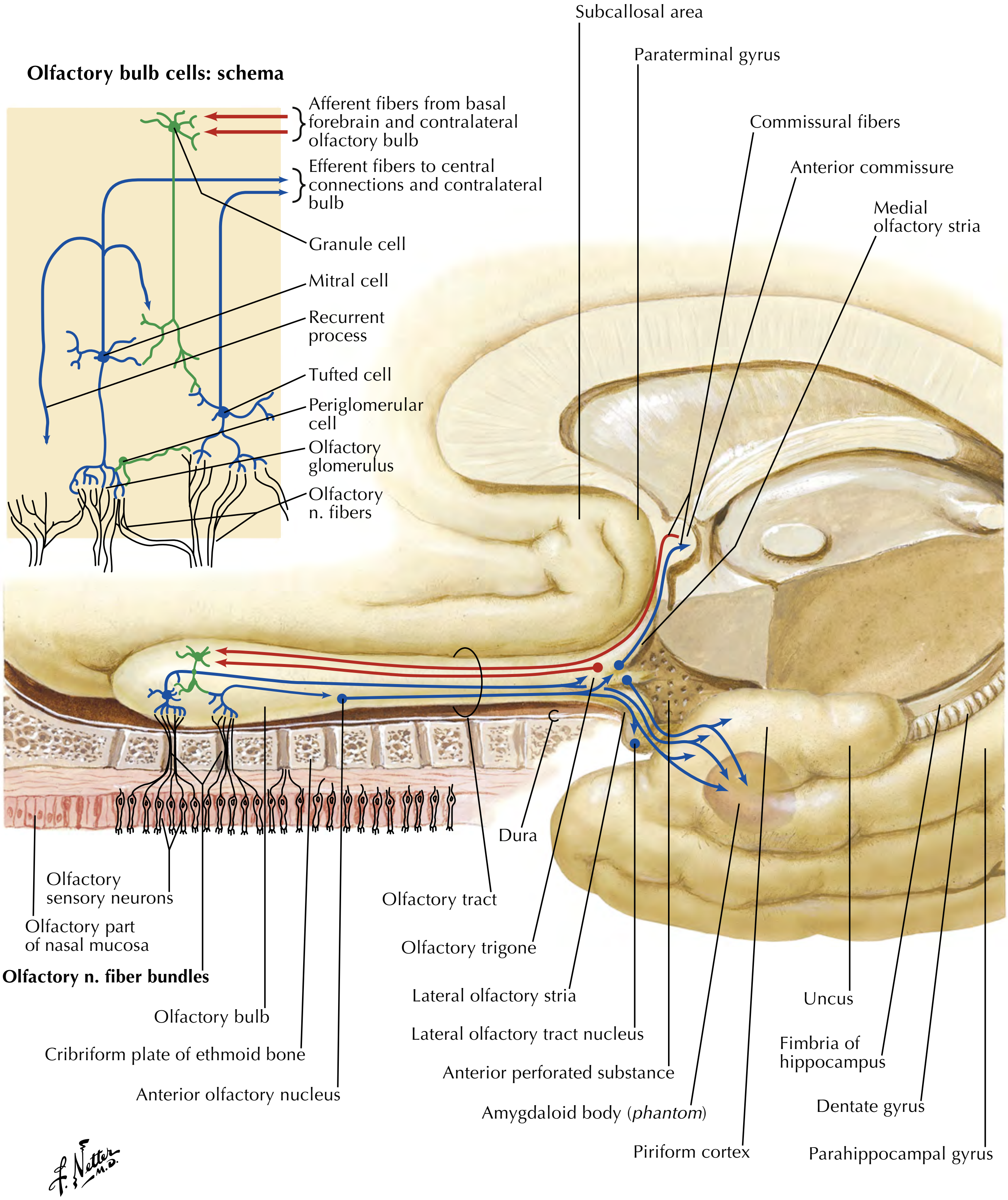
🟥 **Efferent fibers and nuclei of origin**

🟦 **Afferent fibers and nuclei of termination**

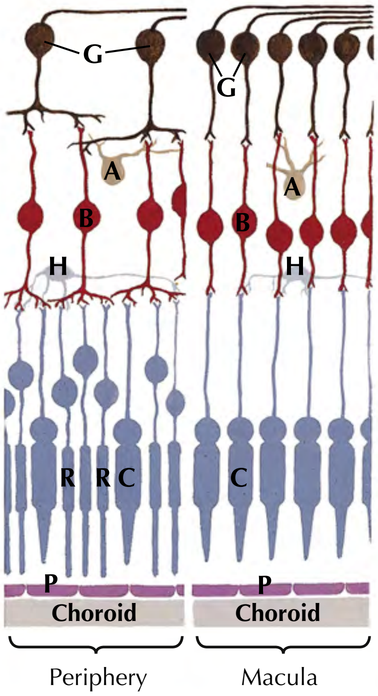
F. Netter M.D.
C. Machado M.D.

Cranial Nerves: Schema of Motor and Sensory Distribution


Efferent (motor) fibers
Afferent (sensory) fibers
CN I
Olfactory
Olfactory part of nasal mucosa
CN II
Optic
Optic part of retina
CN III
Oculomotor
Ciliary m., sphincter pupillae and all external eye mm. except those below
CN IV
Trochlear
Superior oblique m.
CN VI
Abducens
Lateral rectus m.
CN V
Trigeminal
Sensory root—face, sinuses, teeth, orbital and oral cavities, dura
Ophthalmic
Maxillary
Mandibular
Motor root—muscles of mastication; tensor tympani, tensor veli palatini, mylohyoid m., anterior belly of digastric m.
CN VII
Facial
Motor root—muscles of face; stapedius, stylohyoid, occipitalis, auricularis mm.; posterior belly of digastric m.
Intermediate n.
Motor—submandibular, sublingual, lacrimal glands
Taste—anterior 2/3 of tongue
Sensory—soft palate
CN VIII
Vestibulocochlear
Internal ear
Cochlear
Vestibular
CN IX
Glossopharyngeal
Taste—posterior 1/3 of tongue
Sensory—tonsil, pharynx, middle ear
Motor—stylopharyngeus m., parotid gland
CN X
Vagus
Motor—heart, lungs, palate, pharynx, larynx, trachea, bronchi, GI tract
Sensory—heart, lungs, trachea, bronchi, larynx, pharynx, GI tract, external ear
CN XI
Accessory
Sternocleidomastoid, trapezius mm.
CN XII
Hypoglossal
Tongue muscles
F. Netter M.D.

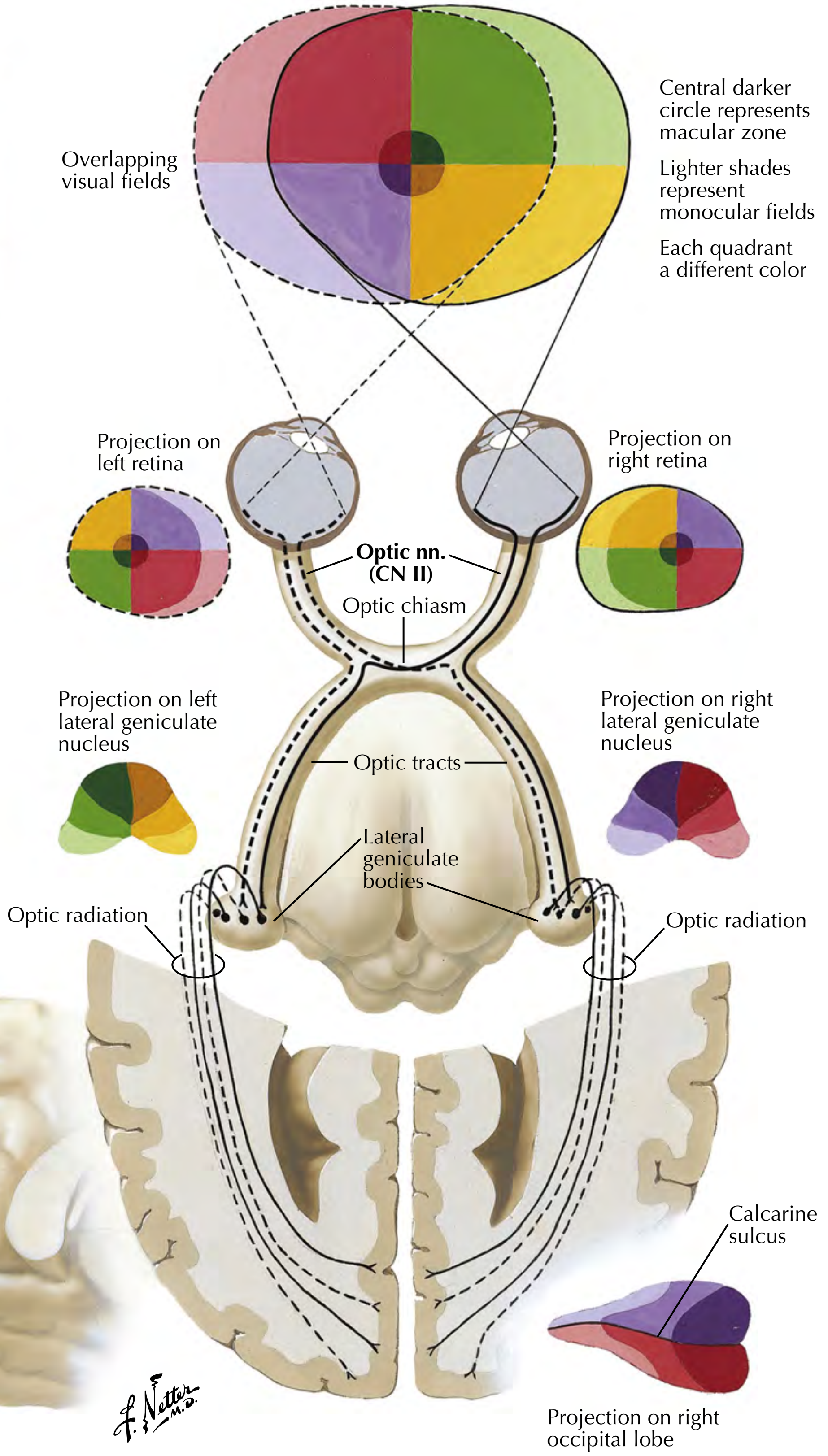

Olfactory bulb cells: schema
Afferent fibers from basal forebrain and contralateral olfactory bulb
Efferent fibers to central connections and contralateral bulb
Granule cell
Mitral cell
Recurrent process
Tufted cell
Periglomerular cell
Olfactory glomerulus
Olfactory n. fibers
Subcallosal area
Paraterminal gyrus
Commissural fibers
Anterior commissure
Medial olfactory stria
C
Dura
Olfactory sensory neurons
Olfactory part of nasal mucosa
Olfactory n. fiber bundles
Olfactory bulb
Cribriform plate of ethmoid bone
Anterior olfactory nucleus
Olfactory tract
Olfactory trigone
Lateral olfactory stria
Lateral olfactory tract nucleus
Anterior perforated substance
Amygdaloid body (phantom)
Piriform cortex
Uncus
Fimbria of hippocampus
Dentate gyrus
Parahippocampal gyrus
F. Netter M.D.

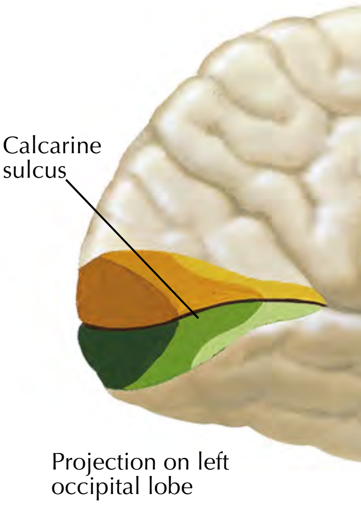
Optic Nerve (CN II) and Visual Pathway: Schema


G
G
A
A
B
B
H
H
R
R
C
C
P
P
Choroid
Choroid
Periphery
Macula

Structure of retina: schema

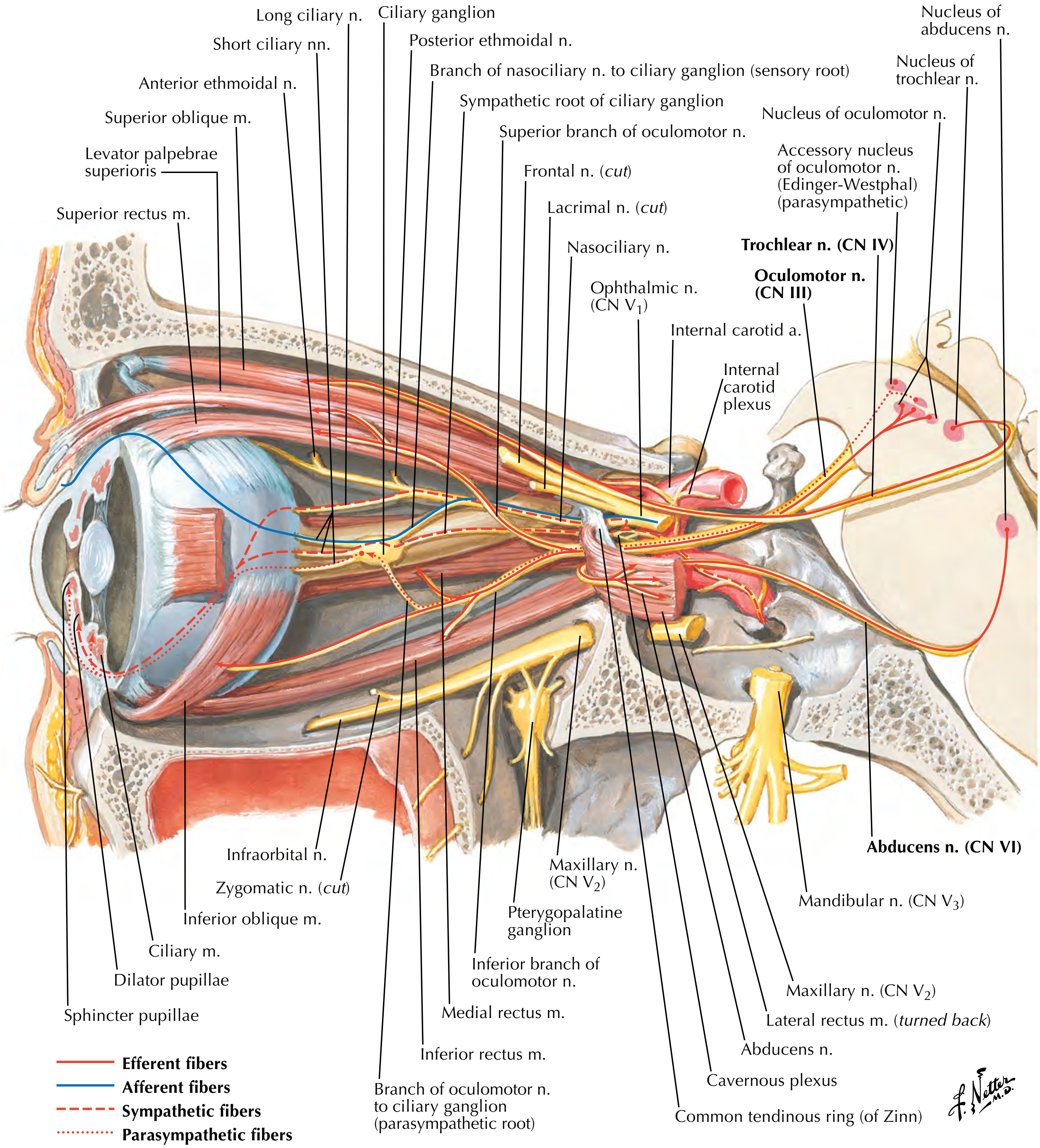
- **A** Amacrine cells
- **B** Bipolar cells
- **C** Cone cells
- **G** Retinal ganglion cells
- **H** Horizontal cells
- **P** Retinal pigment cells
- **R** Rod cells


Overlapping visual fields
Central darker circle represents macular zone
Lighter shades represent monocular fields
Each quadrant a different color
Projection on left retina
Projection on right retina
Optic nn. (CN II)
Optic chiasm
Projection on left lateral geniculate nucleus
Projection on right lateral geniculate nucleus
Optic tracts
Lateral geniculate bodies
Optic radiation
Optic radiation
Calcarine sulcus
Projection on right occipital lobe


Calcarine sulcus
Projection on left occipital lobe

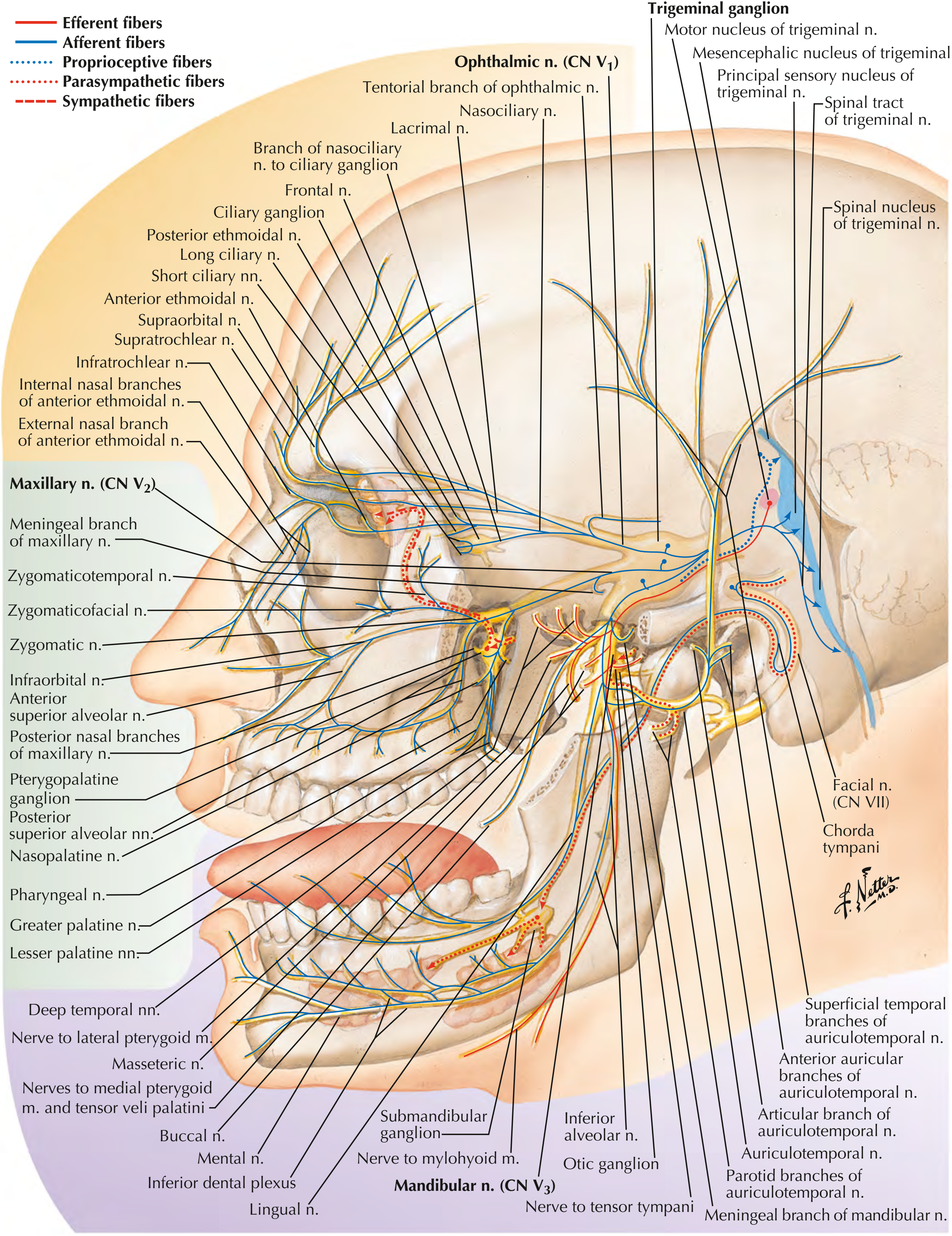
Oculomotor (CN III), Trochlear (CN IV), and Abducens (CN VI) Nerves: Schema

See also **Plates 113, 159**


Long ciliary n.
Ciliary ganglion
Short ciliary nn.
Posterior ethmoidal n.
Branch of nasociliary n. to ciliary ganglion (sensory root)
Anterior ethmoidal n.
Sympathetic root of ciliary ganglion
Superior oblique m.
Superior branch of oculomotor n.
Levator palpebrae superioris
Frontal n. (*cut*)
Lacrimal n. (*cut*)
Superior rectus m.
Nasociliary n.
Ophthalmic n. (CN V_1)
Internal carotid a.
Internal carotid plexus
Nucleus of abducens n.
Nucleus of trochlear n.
Nucleus of oculomotor n.
Accessory nucleus of oculomotor n. (Edinger-Westphal) (parasympathetic)
Trochlear n. (CN IV)
Oculomotor n. (CN III)
Abducens n. (CN VI)
Infraorbital n.
Zygomatic n. (*cut*)
Inferior oblique m.
Ciliary m.
Dilator pupillae
Sphincter pupillae
Maxillary n. (CN V_2)
Pterygopalatine ganglion
Inferior branch of oculomotor n.
Medial rectus m.
Inferior rectus m.
Branch of oculomotor n. to ciliary ganglion (parasympathetic root)
Mandibular n. (CN V_3)
Maxillary n. (CN V_2)
Lateral rectus m. (*turned back*)
Abducens n.
Cavernous plexus
Common tendinous ring (of Zinn)
Efferent fibers
Afferent fibers
Sympathetic fibers
Parasympathetic fibers
F. Netter M.D.

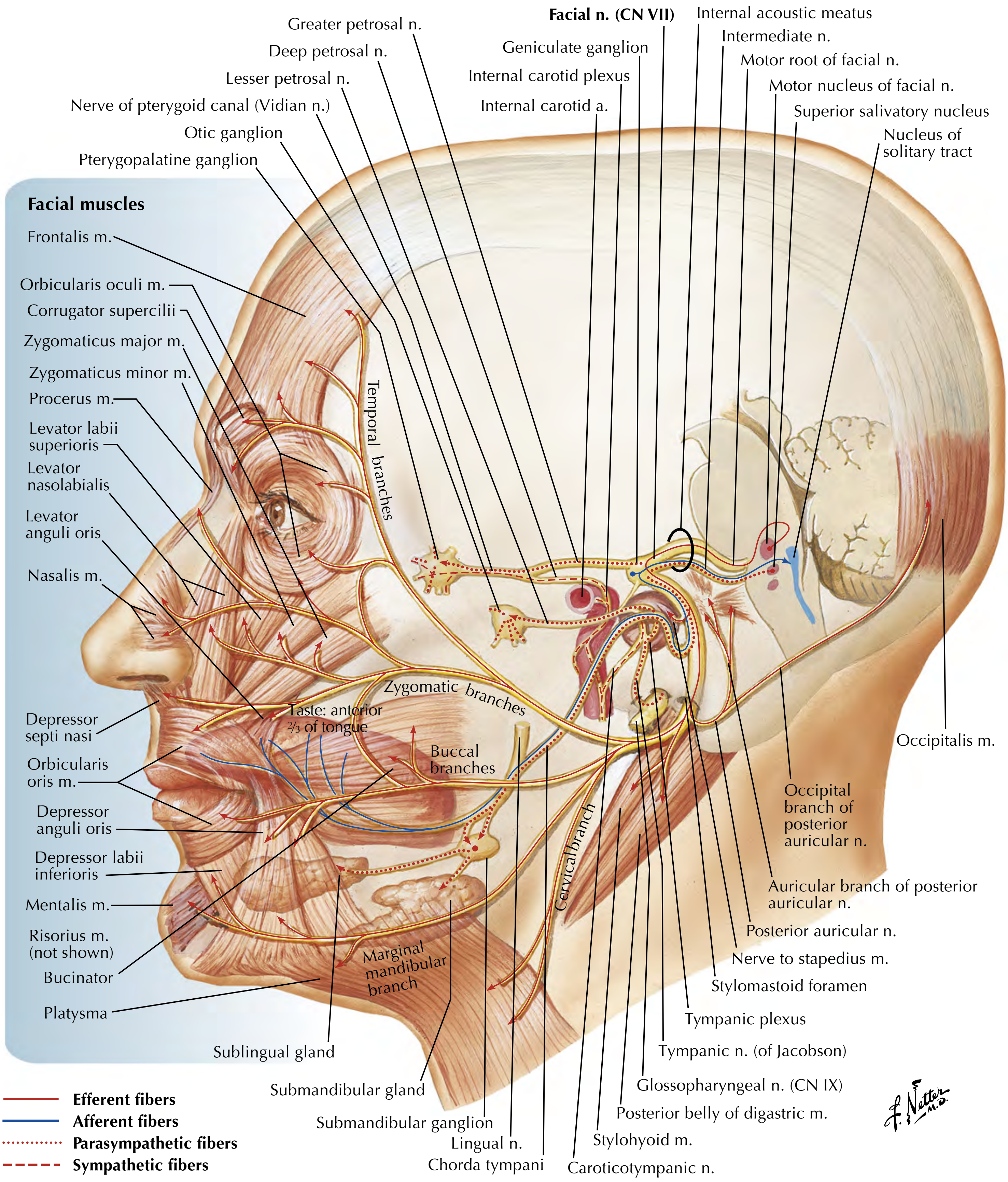
Trigeminal Nerve (CN V): Schema

See also **Plates 23, 77, 79**

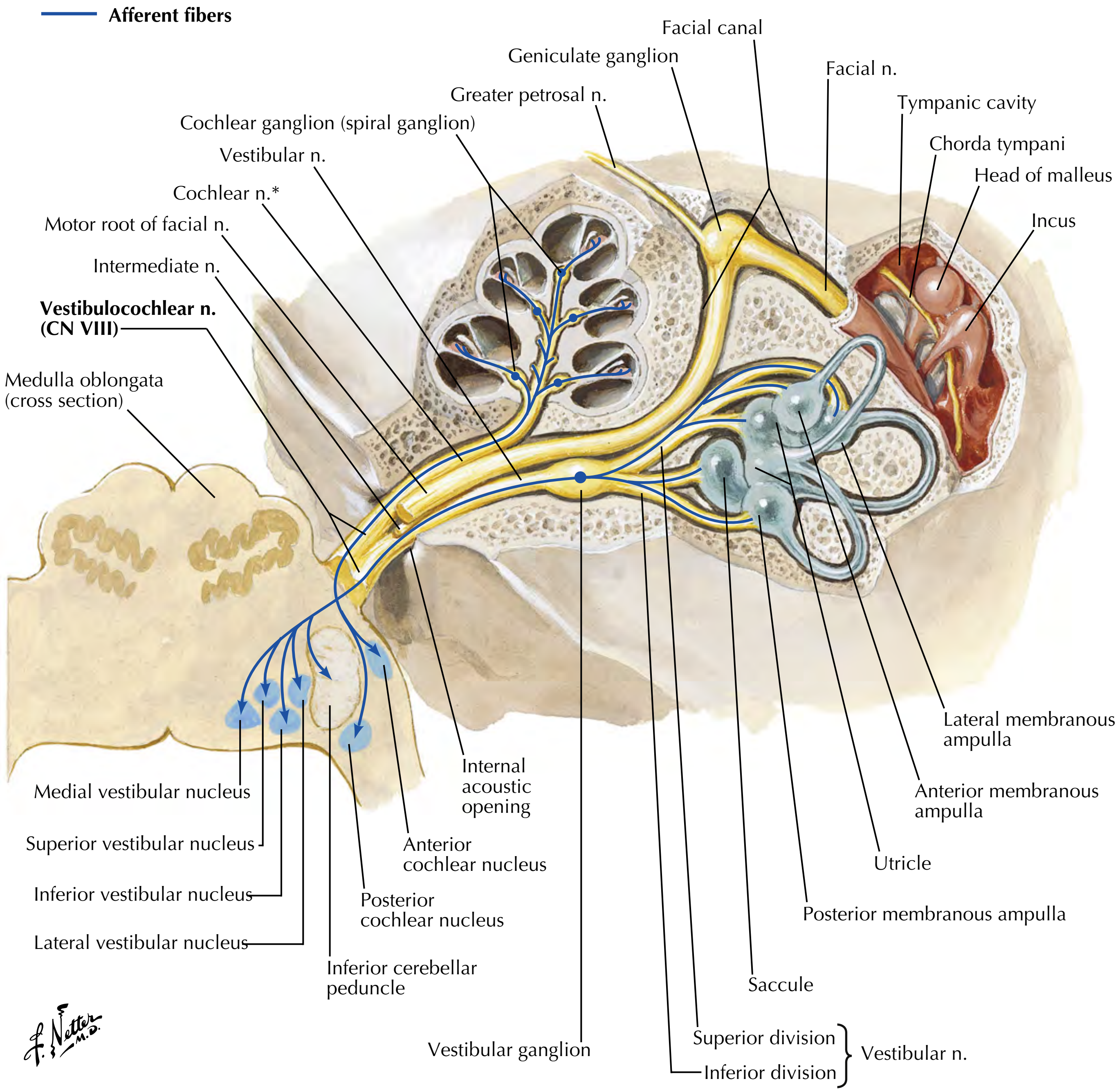

—— Efferent fibers
—— Afferent fibers
······· Proprioceptive fibers
······· Parasympathetic fibers
– – – – Sympathetic fibers
Trigeminal ganglion
Motor nucleus of trigeminal n.
Mesencephalic nucleus of trigeminal n.
Principal sensory nucleus of trigeminal n.
Spinal tract of trigeminal n.
Ophthalmic n. (CN V_1)
Tentorial branch of ophthalmic n.
Nasociliary n.
Lacrimal n.
Branch of nasociliary n. to ciliary ganglion
Frontal n.
Ciliary ganglion
Posterior ethmoidal n.
Long ciliary n.
Short ciliary nn.
Anterior ethmoidal n.
Supraorbital n.
Supratrochlear n.
Infratrochlear n.
Internal nasal branches of anterior ethmoidal n.
External nasal branch of anterior ethmoidal n.
Spinal nucleus of trigeminal n.
Maxillary n. (CN V_2)
Meningeal branch of maxillary n.
Zygomaticotemporal n.
Zygomaticofacial n.
Zygomatic n.
Infraorbital n.
Anterior superior alveolar n.
Posterior nasal branches of maxillary n.
Pterygopalatine ganglion
Posterior superior alveolar nn.
Nasopalatine n.
Pharyngeal n.
Greater palatine n.
Lesser palatine nn.
Facial n. (CN VII)
Chorda tympani
Deep temporal nn.
Nerve to lateral pterygoid m.
Masseteric n.
Nerves to medial pterygoid m. and tensor veli palatini
Buccal n.
Mental n.
Inferior dental plexus
Lingual n.
Submandibular ganglion
Nerve to mylohyoid m.
Mandibular n. (CN V_3)
Inferior alveolar n.
Otic ganglion
Nerve to tensor tympani
Superficial temporal branches of auriculotemporal n.
Anterior auricular branches of auriculotemporal n.
Articular branch of auriculotemporal n.
Auriculotemporal n.
Parotid branches of auriculotemporal n.
Meningeal branch of mandibular n.

Facial Nerve (CN VII): Schema

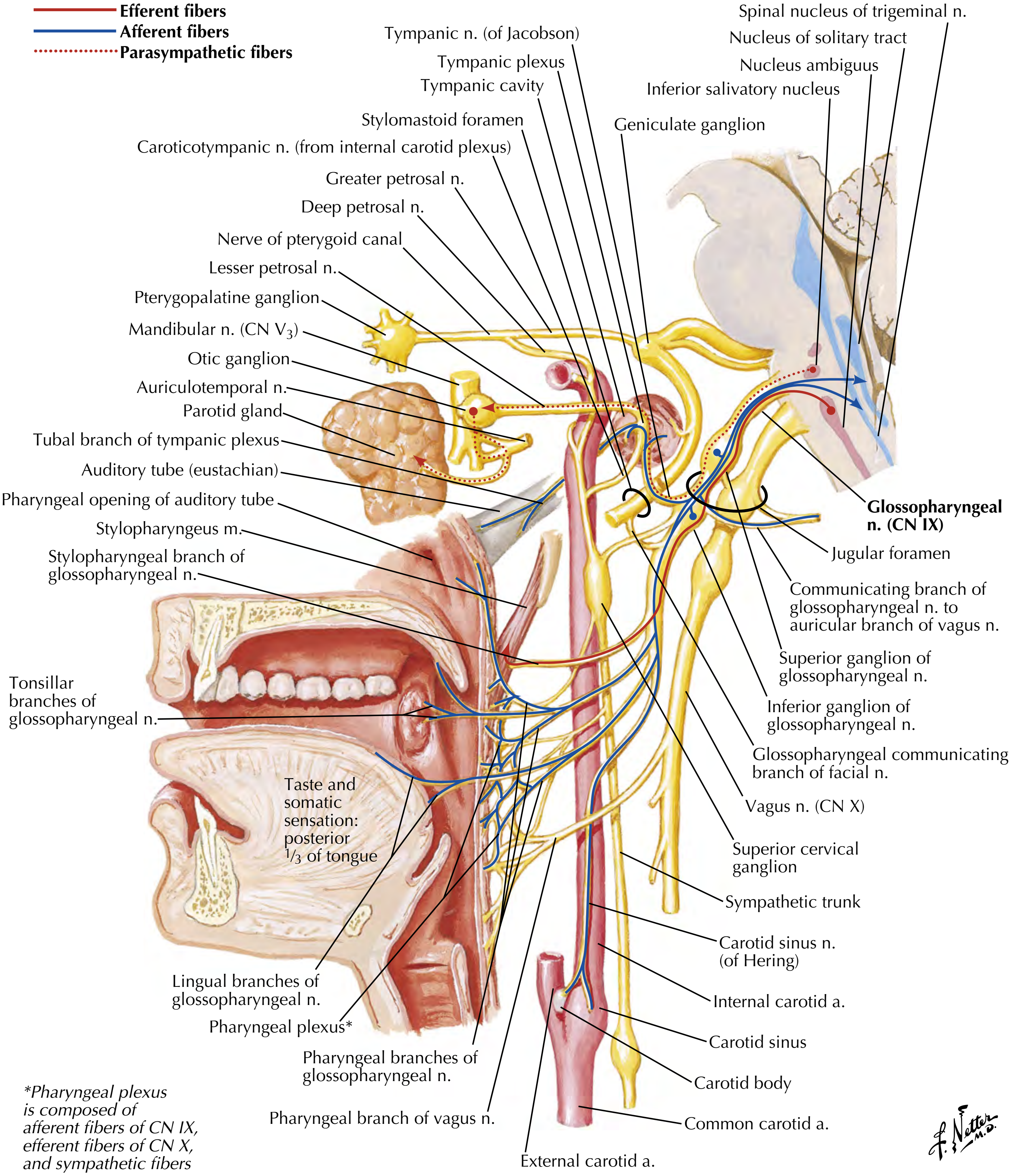
See also Plate 71


Greater petrosal n.
Deep petrosal n.
Lesser petrosal n.
Nerve of pterygoid canal (Vidian n.)
Otic ganglion
Pterygopalatine ganglion
Facial n. (CN VII)
Geniculate ganglion
Internal carotid plexus
Internal carotid a.
Internal acoustic meatus
Intermediate n.
Motor root of facial n.
Motor nucleus of facial n.
Superior salivatory nucleus
Nucleus of solitary tract
Facial muscles
Frontalis m.
Orbicularis oculi m.
Corrugator supercilii
Zygomaticus major m.
Zygomaticus minor m.
Procerus m.
Levator labii superioris
Levator nasolabialis
Levator anguli oris
Nasalis m.
Depressor septi nasi
Orbicularis oris m.
Depressor anguli oris
Depressor labii inferioris
Mentalis m.
Risorius m. (not shown)
Bucinator
Platysma
Temporal branches
Zygomatic branches
Taste: anterior ⅔ of tongue
Buccal branches
Marginal mandibular branch
Cervical branch
Occipitalis m.
Occipital branch of posterior auricular n.
Auricular branch of posterior auricular n.
Posterior auricular n.
Nerve to stapedius m.
Stylomastoid foramen
Tympanic plexus
Tympanic n. (of Jacobson)
Glossopharyngeal n. (CN IX)
Posterior belly of digastric m.
Stylohyoid m.
Caroticotympanic n.
Sublingual gland
Submandibular gland
Submandibular ganglion
Lingual n.
Chorda tympani
Efferent fibers
Afferent fibers
Parasympathetic fibers
Sympathetic fibers
F. Netter M.D.

Vestibulocochlear Nerve (CN VIII): Schema

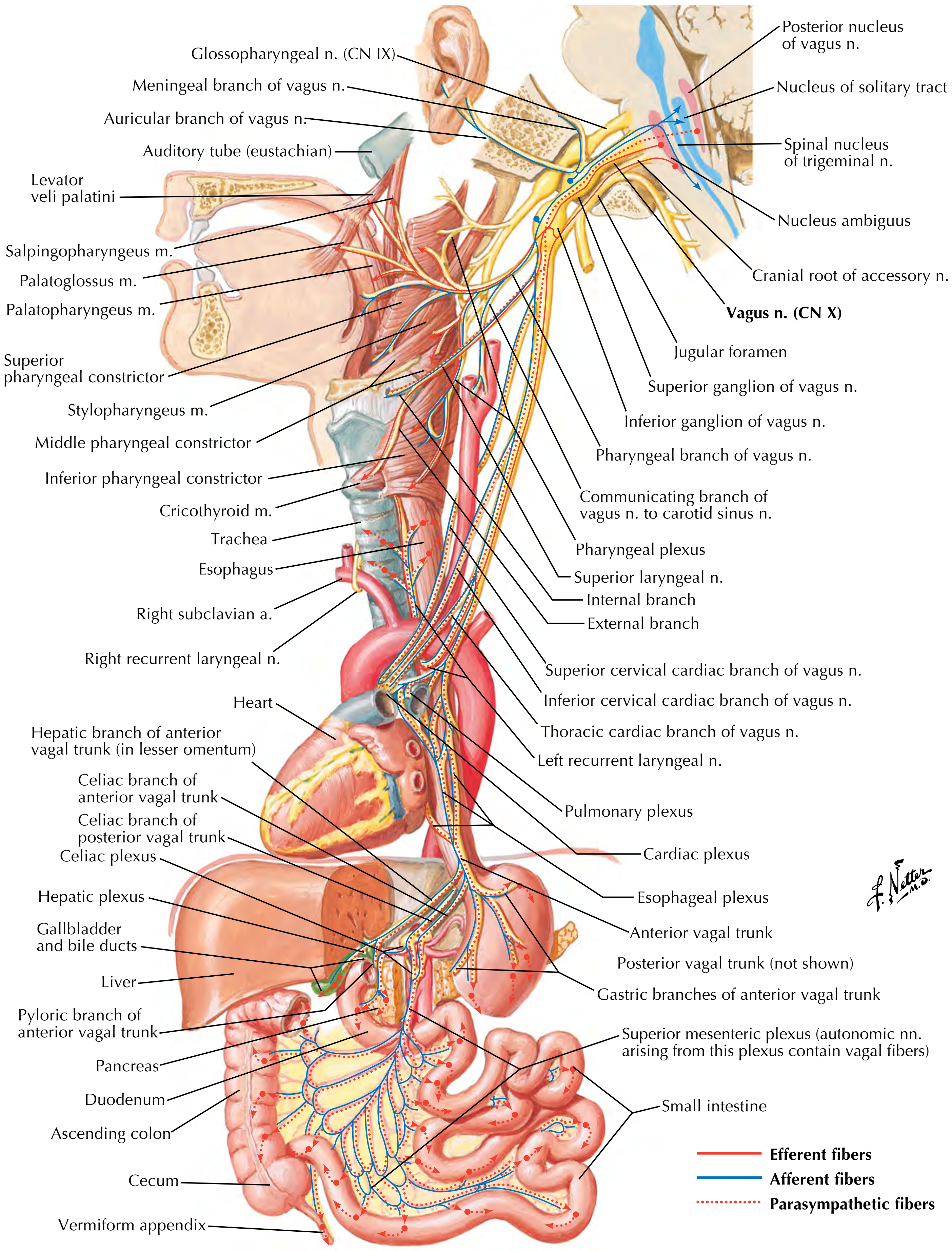

Afferent fibers
Facial canal
Geniculate ganglion
Greater petrosal n.
Cochlear ganglion (spiral ganglion)
Vestibular n.
Cochlear n.*
Motor root of facial n.
Intermediate n.
Vestibulocochlear n. (CN VIII)
Medulla oblongata (cross section)
Facial n.
Tympanic cavity
Chorda tympani
Head of malleus
Incus
Lateral membranous ampulla
Anterior membranous ampulla
Utricle
Posterior membranous ampulla
Saccule
Internal acoustic opening
Anterior cochlear nucleus
Posterior cochlear nucleus
Inferior cerebellar peduncle
Medial vestibular nucleus
Superior vestibular nucleus
Inferior vestibular nucleus
Lateral vestibular nucleus
Vestibular ganglion
Superior division
Inferior division
Vestibular n.
F. Netter M.D.

Note: The cochlear nerve also contains efferent fibers to the sensory epithelium. These fibers are derived from the vestibular nerve while in the internal acoustic meatus.

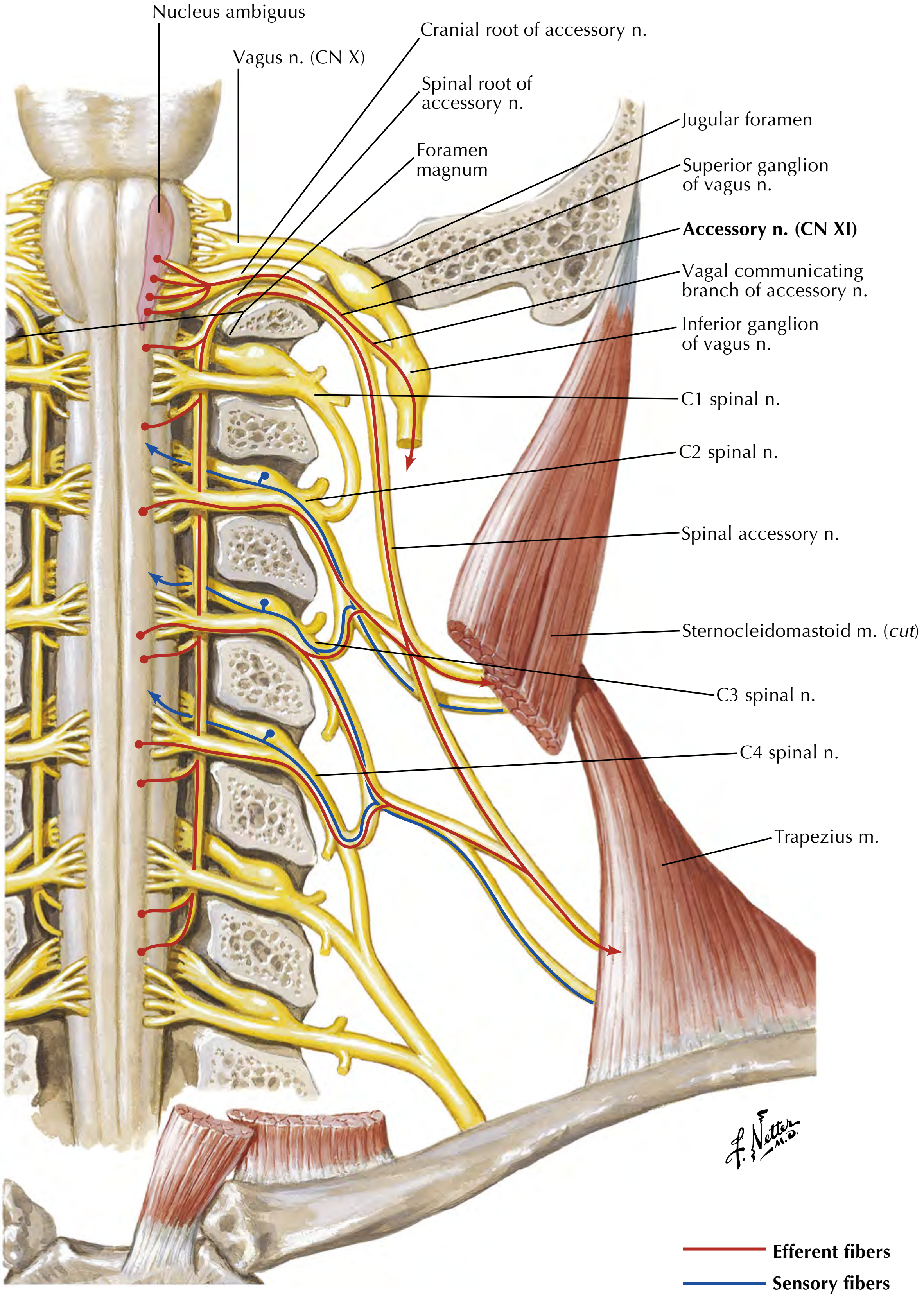

Efferent fibers
Afferent fibers
Parasympathetic fibers
Tympanic n. (of Jacobson)
Tympanic plexus
Tympanic cavity
Stylomastoid foramen
Caroticotympanic n. (from internal carotid plexus)
Greater petrosal n.
Deep petrosal n.
Nerve of pterygoid canal
Lesser petrosal n.
Pterygopalatine ganglion
Mandibular n. (CN V$_3$)
Otic ganglion
Auriculotemporal n.
Parotid gland
Tubal branch of tympanic plexus
Auditory tube (eustachian)
Pharyngeal opening of auditory tube
Stylopharyngeus m.
Stylopharyngeal branch of glossopharyngeal n.
Tonsillar branches of glossopharyngeal n.
Taste and somatic sensation: posterior 1/3 of tongue
Lingual branches of glossopharyngeal n.
Pharyngeal plexus*
Pharyngeal branches of glossopharyngeal n.
Pharyngeal branch of vagus n.
External carotid a.
Spinal nucleus of trigeminal n.
Nucleus of solitary tract
Nucleus ambiguus
Inferior salivatory nucleus
Geniculate ganglion
Glossopharyngeal n. (CN IX)
Jugular foramen
Communicating branch of glossopharyngeal n. to auricular branch of vagus n.
Superior ganglion of glossopharyngeal n.
Inferior ganglion of glossopharyngeal n.
Glossopharyngeal communicating branch of facial n.
Vagus n. (CN X)
Superior cervical ganglion
Sympathetic trunk
Carotid sinus n. (of Hering)
Internal carotid a.
Carotid sinus
Carotid body
Common carotid a.

Pharyngeal plexus is composed of afferent fibers of CN IX, efferent fibers of CN X, and sympathetic fibers

Vagus Nerve (CN X): Schema


Glossopharyngeal n. (CN IX)
Meningeal branch of vagus n.
Auricular branch of vagus n.
Auditory tube (eustachian)
Levator veli palatini
Salpingopharyngeus m.
Palatoglossus m.
Palatopharyngeus m.
Superior pharyngeal constrictor
Stylopharyngeus m.
Middle pharyngeal constrictor
Inferior pharyngeal constrictor
Cricothyroid m.
Trachea
Esophagus
Right subclavian a.
Right recurrent laryngeal n.
Heart
Hepatic branch of anterior vagal trunk (in lesser omentum)
Celiac branch of anterior vagal trunk
Celiac branch of posterior vagal trunk
Celiac plexus
Hepatic plexus
Gallbladder and bile ducts
Liver
Pyloric branch of anterior vagal trunk
Pancreas
Duodenum
Ascending colon
Cecum
Vermiform appendix
Posterior nucleus of vagus n.
Nucleus of solitary tract
Spinal nucleus of trigeminal n.
Nucleus ambiguus
Cranial root of accessory n.
Vagus n. (CN X)
Jugular foramen
Superior ganglion of vagus n.
Inferior ganglion of vagus n.
Pharyngeal branch of vagus n.
Communicating branch of vagus n. to carotid sinus n.
Pharyngeal plexus
Superior laryngeal n.
Internal branch
External branch
Superior cervical cardiac branch of vagus n.
Inferior cervical cardiac branch of vagus n.
Thoracic cardiac branch of vagus n.
Left recurrent laryngeal n.
Pulmonary plexus
Cardiac plexus
Esophageal plexus
Anterior vagal trunk
Posterior vagal trunk (not shown)
Gastric branches of anterior vagal trunk
Superior mesenteric plexus (autonomic nn. arising from this plexus contain vagal fibers)
Small intestine
Efferent fibers
Afferent fibers
Parasympathetic fibers

See also **Plate 56**

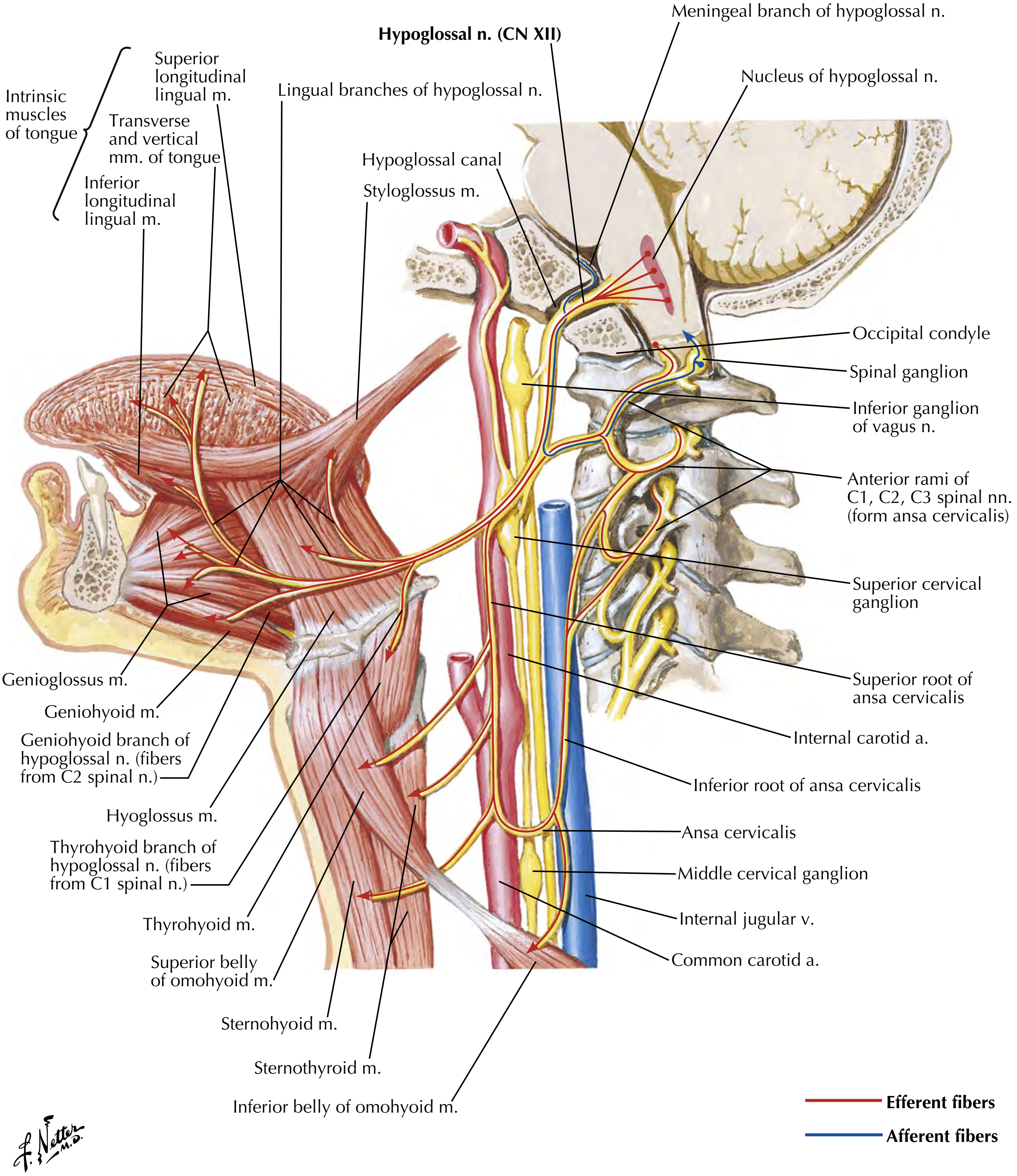

Nucleus ambiguus
Vagus n. (CN X)
Cranial root of accessory n.
Spinal root of accessory n.
Foramen magnum
Jugular foramen
Superior ganglion of vagus n.
Accessory n. (CN XI)
Vagal communicating branch of accessory n.
Inferior ganglion of vagus n.
C1 spinal n.
C2 spinal n.
Spinal accessory n.
Sternocleidomastoid m. (*cut*)
C3 spinal n.
C4 spinal n.
Trapezius m.
F. Netter M.D.

Efferent fibers

Sensory fibers

Hypoglossal Nerve (CN XII): Schema

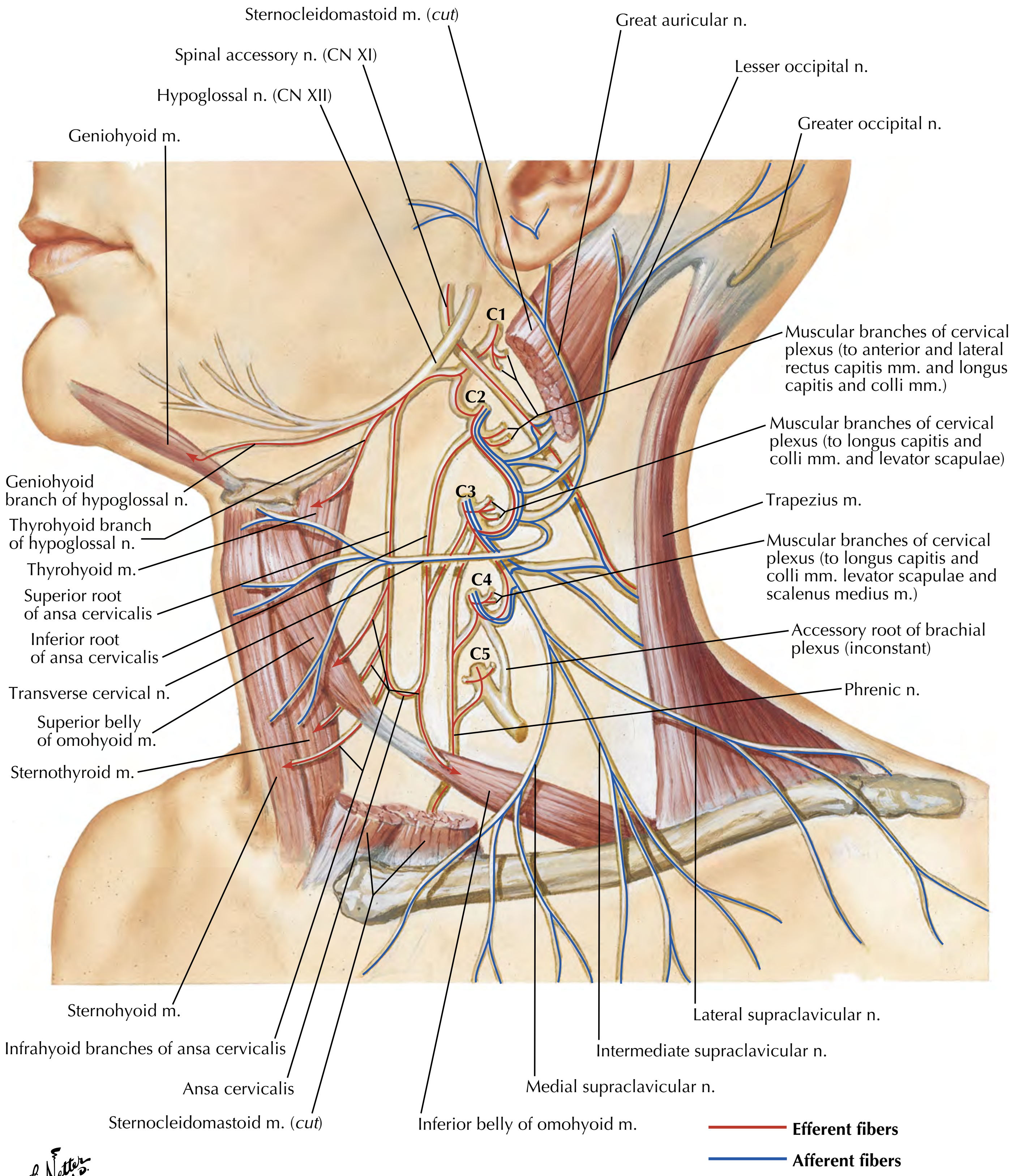
See also **Plate 56**



Intrinsic muscles of tongue
Superior longitudinal lingual m.
Transverse and vertical mm. of tongue
Inferior longitudinal lingual m.
Lingual branches of hypoglossal n.
Hypoglossal n. (CN XII)
Hypoglossal canal
Styloglossus m.
Meningeal branch of hypoglossal n.
Nucleus of hypoglossal n.
Occipital condyle
Spinal ganglion
Inferior ganglion of vagus n.
Anterior rami of C1, C2, C3 spinal nn. (form ansa cervicalis)
Superior cervical ganglion
Superior root of ansa cervicalis
Internal carotid a.
Inferior root of ansa cervicalis
Ansa cervicalis
Middle cervical ganglion
Internal jugular v.
Common carotid a.
Genioglossus m.
Geniohyoid m.
Geniohyoid branch of hypoglossal n. (fibers from C2 spinal n.)
Hyoglossus m.
Thyrohyoid branch of hypoglossal n. (fibers from C1 spinal n.)
Thyrohyoid m.
Superior belly of omohyoid m.
Sternohyoid m.
Sternothyroid m.
Inferior belly of omohyoid m.
Efferent fibers
Afferent fibers

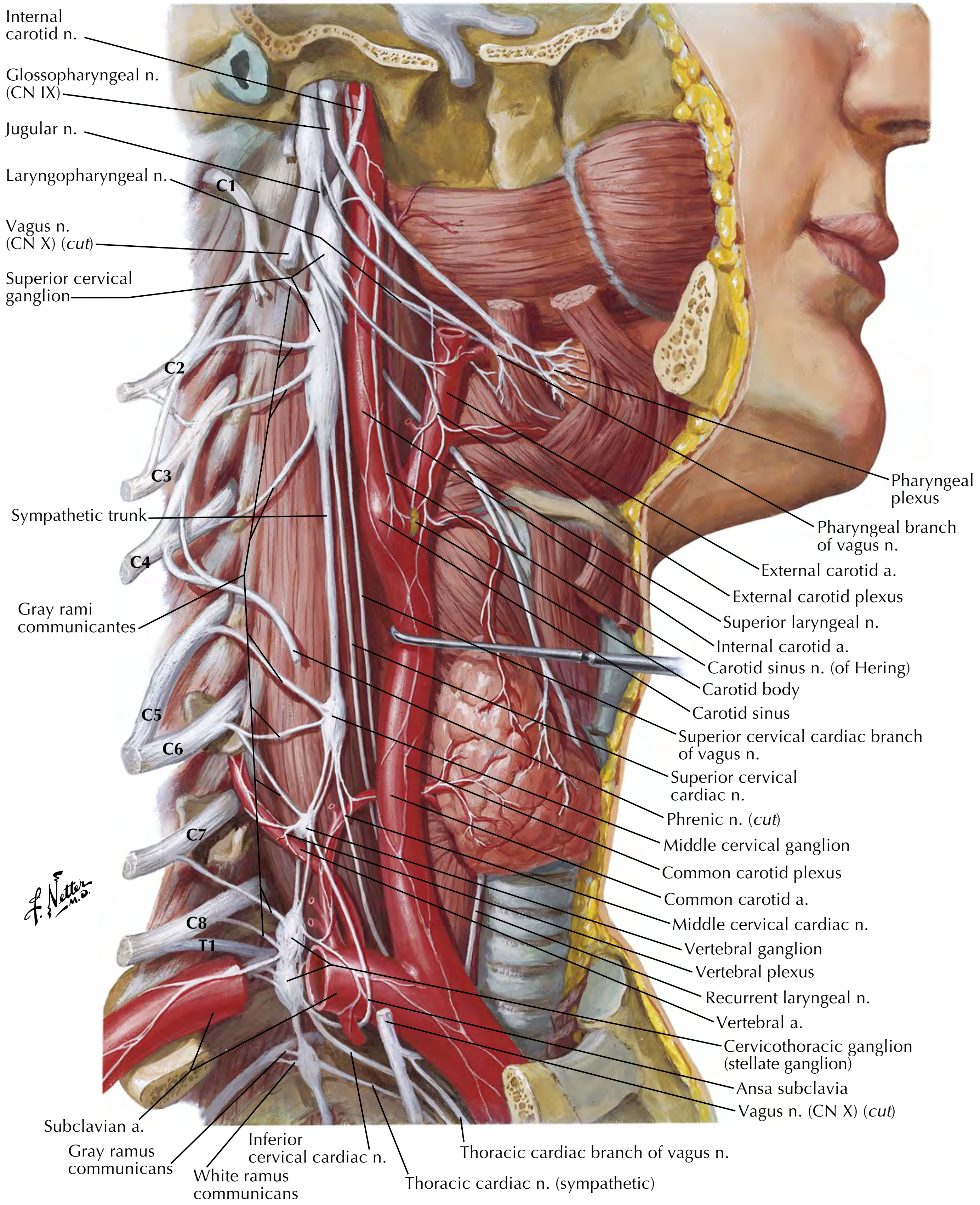
Cervical Plexus: Schema

See also **Plates 56, 57**

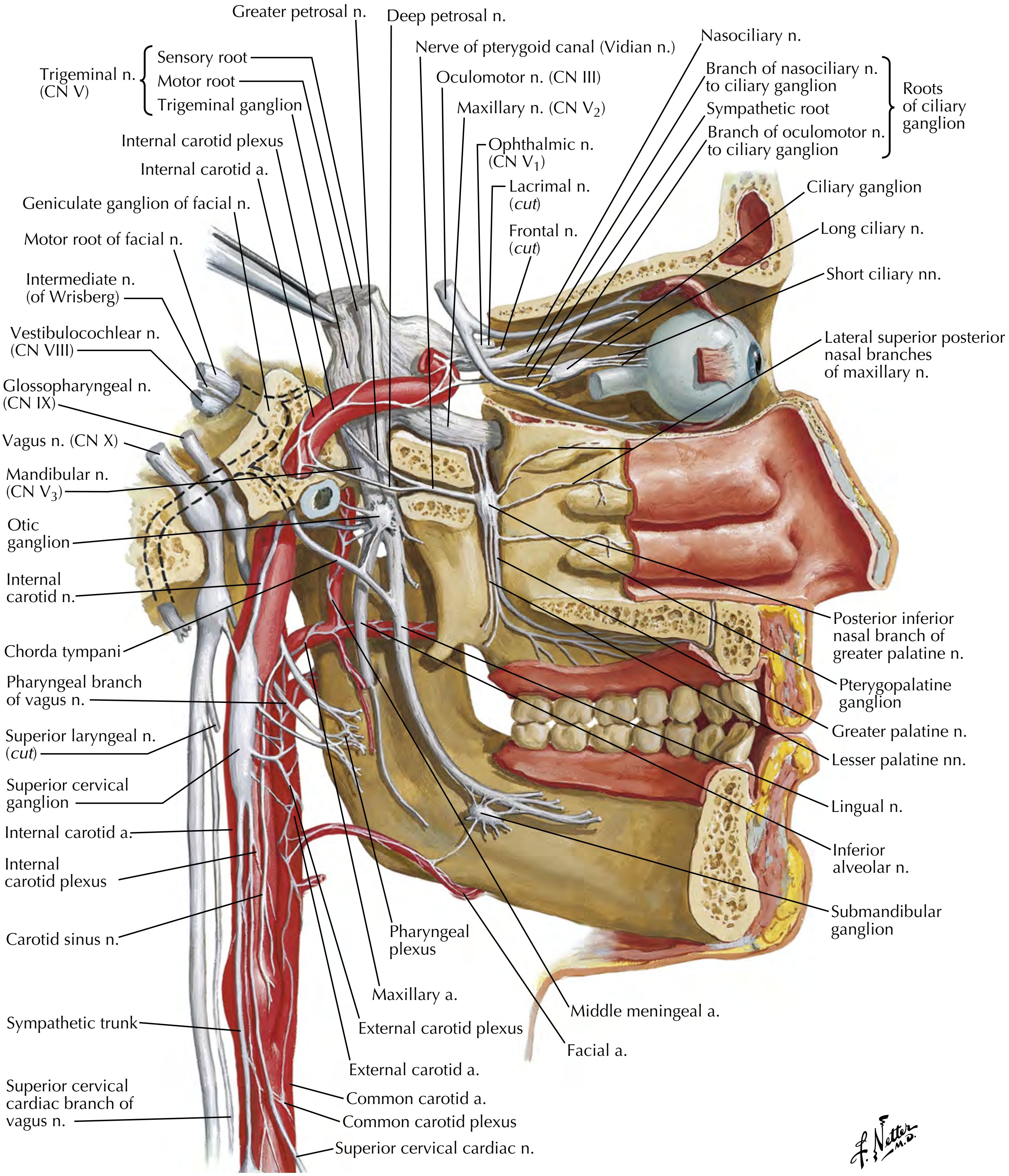

Sternocleidomastoid m. (*cut*)
Spinal accessory n. (CN XI)
Hypoglossal n. (CN XII)
Geniohyoid m.
Great auricular n.
Lesser occipital n.
Greater occipital n.
C1
C2
C3
C4
C5
Muscular branches of cervical plexus (to anterior and lateral rectus capitis mm. and longus capitis and colli mm.)
Muscular branches of cervical plexus (to longus capitis and colli mm. and levator scapulae)
Trapezius m.
Muscular branches of cervical plexus (to longus capitis and colli mm. levator scapulae and scalenus medius m.)
Accessory root of brachial plexus (inconstant)
Phrenic n.
Geniohyoid branch of hypoglossal n.
Thyrohyoid branch of hypoglossal n.
Thyrohyoid m.
Superior root of ansa cervicalis
Inferior root of ansa cervicalis
Transverse cervical n.
Superior belly of omohyoid m.
Sternothyroid m.
Sternohyoid m.
Infrahyoid branches of ansa cervicalis
Ansa cervicalis
Sternocleidomastoid m. (*cut*)
Inferior belly of omohyoid m.
Medial supraclavicular n.
Intermediate supraclavicular n.
Lateral supraclavicular n.
Efferent fibers
Afferent fibers

Autonomic Nerves in Neck

See also **Plate 152**

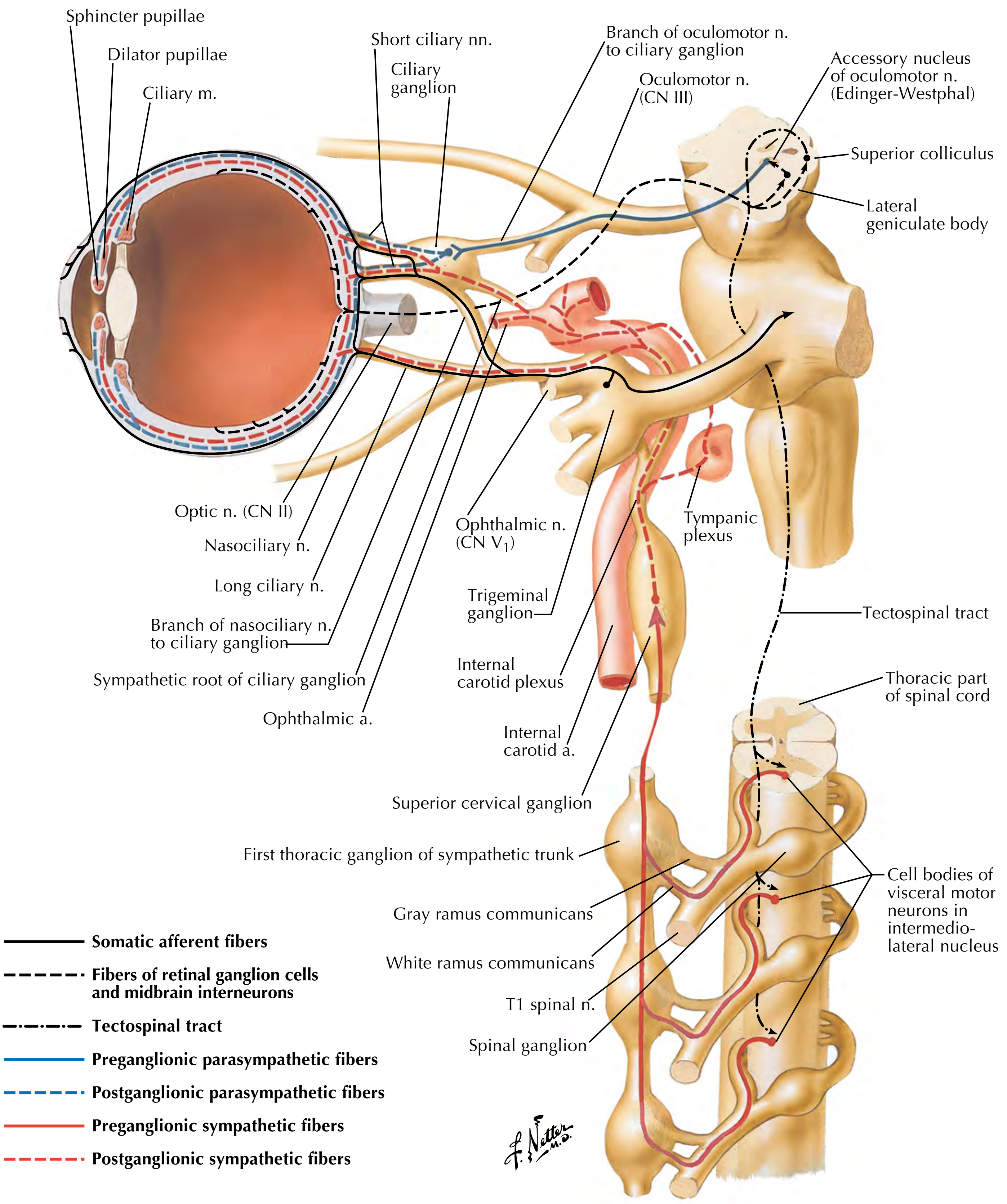

Internal carotid n.
Glossopharyngeal n. (CN IX)
Jugular n.
Laryngopharyngeal n.
C1
Vagus n. (CN X) (*cut*)
Superior cervical ganglion
C2
C3
Sympathetic trunk
C4
Gray rami communicantes
C5
C6
C7
C8
T1
Subclavian a.
Gray ramus communicans
White ramus communicans
Inferior cervical cardiac n.
Thoracic cardiac n. (sympathetic)
Thoracic cardiac branch of vagus n.
Pharyngeal plexus
Pharyngeal branch of vagus n.
External carotid a.
External carotid plexus
Superior laryngeal n.
Internal carotid a.
Carotid sinus n. (of Hering)
Carotid body
Carotid sinus
Superior cervical cardiac branch of vagus n.
Superior cervical cardiac n.
Phrenic n. (*cut*)
Middle cervical ganglion
Common carotid plexus
Common carotid a.
Middle cervical cardiac n.
Vertebral ganglion
Vertebral plexus
Recurrent laryngeal n.
Vertebral a.
Cervicothoracic ganglion (stellate ganglion)
Ansa subclavia
Vagus n. (CN X) (*cut*)

See also **Plates 80, 149, 160**


Greater petrosal n.
Deep petrosal n.
Nerve of pterygoid canal (Vidian n.)
Nasociliary n.
Trigeminal n. (CN V)
Sensory root
Motor root
Trigeminal ganglion
Oculomotor n. (CN III)
Maxillary n. (CN V_2)
Branch of nasociliary n. to ciliary ganglion
Sympathetic root
Branch of oculomotor n. to ciliary ganglion
Roots of ciliary ganglion
Internal carotid plexus
Internal carotid a.
Ophthalmic n. (CN V_1)
Lacrimal n. (*cut*)
Geniculate ganglion of facial n.
Frontal n. (*cut*)
Ciliary ganglion
Long ciliary n.
Motor root of facial n.
Short ciliary nn.
Intermediate n. (of Wrisberg)
Vestibulocochlear n. (CN VIII)
Lateral superior posterior nasal branches of maxillary n.
Glossopharyngeal n. (CN IX)
Vagus n. (CN X)
Mandibular n. (CN V_3)
Otic ganglion
Internal carotid n.
Chorda tympani
Posterior inferior nasal branch of greater palatine n.
Pterygopalatine ganglion
Pharyngeal branch of vagus n.
Greater palatine n.
Superior laryngeal n. (*cut*)
Lesser palatine nn.
Superior cervical ganglion
Lingual n.
Internal carotid a.
Inferior alveolar n.
Internal carotid plexus
Submandibular ganglion
Carotid sinus n.
Pharyngeal plexus
Maxillary a.
Middle meningeal a.
Sympathetic trunk
External carotid plexus
Facial a.
External carotid a.
Common carotid a.
Superior cervical cardiac branch of vagus n.
Common carotid plexus
Superior cervical cardiac n.
F. Netter M.D.

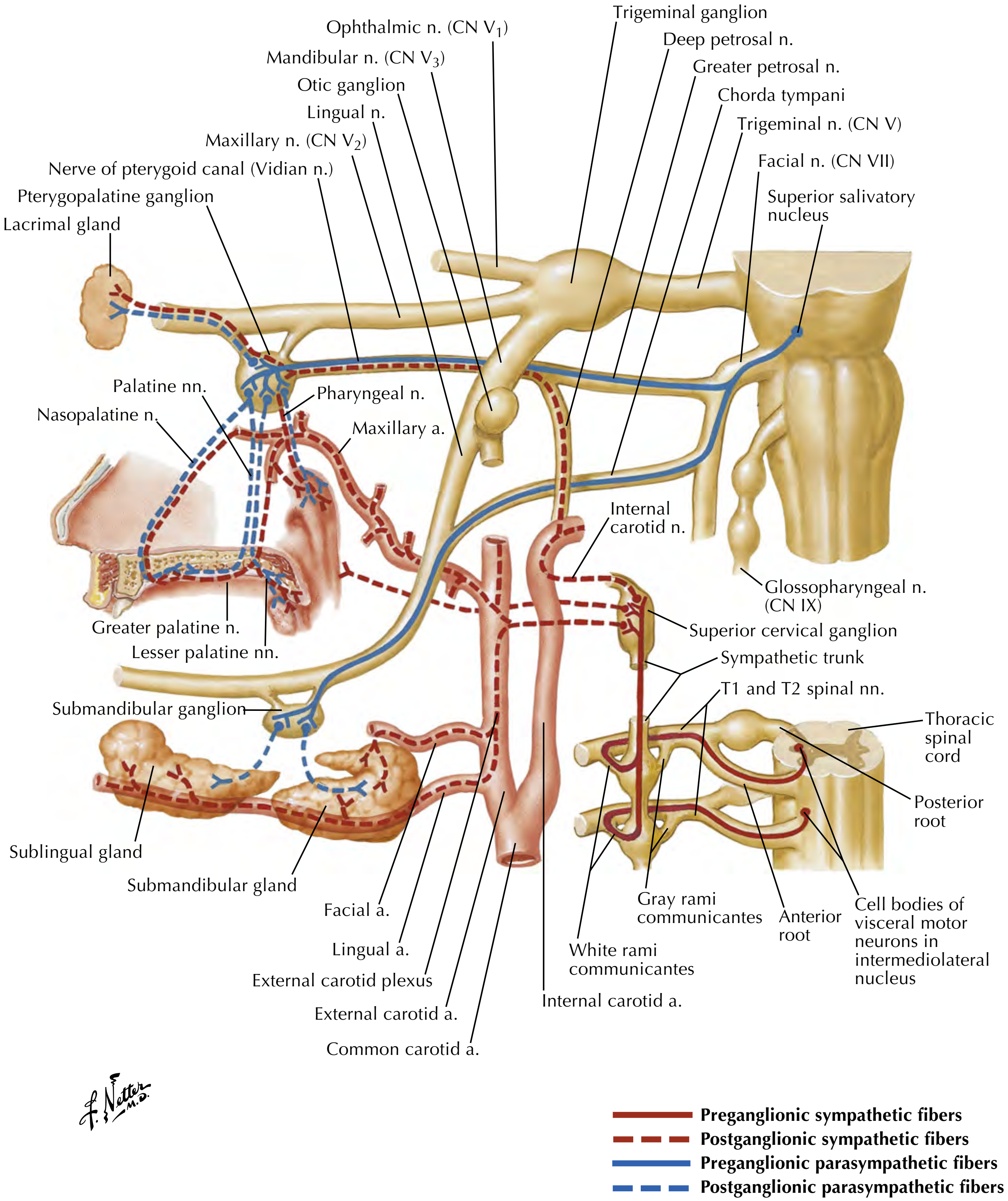
Ciliary Ganglion: Schema

See also **Plates 80, 149, 160**


Sphincter pupillae
Dilator pupillae
Ciliary m.
Short ciliary nn.
Ciliary ganglion
Branch of oculomotor n. to ciliary ganglion
Oculomotor n. (CN III)
Accessory nucleus of oculomotor n. (Edinger-Westphal)
Superior colliculus
Lateral geniculate body
Optic n. (CN II)
Nasociliary n.
Long ciliary n.
Branch of nasociliary n. to ciliary ganglion
Sympathetic root of ciliary ganglion
Ophthalmic a.
Ophthalmic n. (CN V1)
Trigeminal ganglion
Internal carotid plexus
Internal carotid a.
Tympanic plexus
Tectospinal tract
Thoracic part of spinal cord
Superior cervical ganglion
First thoracic ganglion of sympathetic trunk
Gray ramus communicans
White ramus communicans
T1 spinal n.
Spinal ganglion
Cell bodies of visceral motor neurons in intermedio-lateral nucleus
Somatic afferent fibers
Fibers of retinal ganglion cells and midbrain interneurons
Tectospinal tract
Preganglionic parasympathetic fibers
Postganglionic parasympathetic fibers
Preganglionic sympathetic fibers
Postganglionic sympathetic fibers

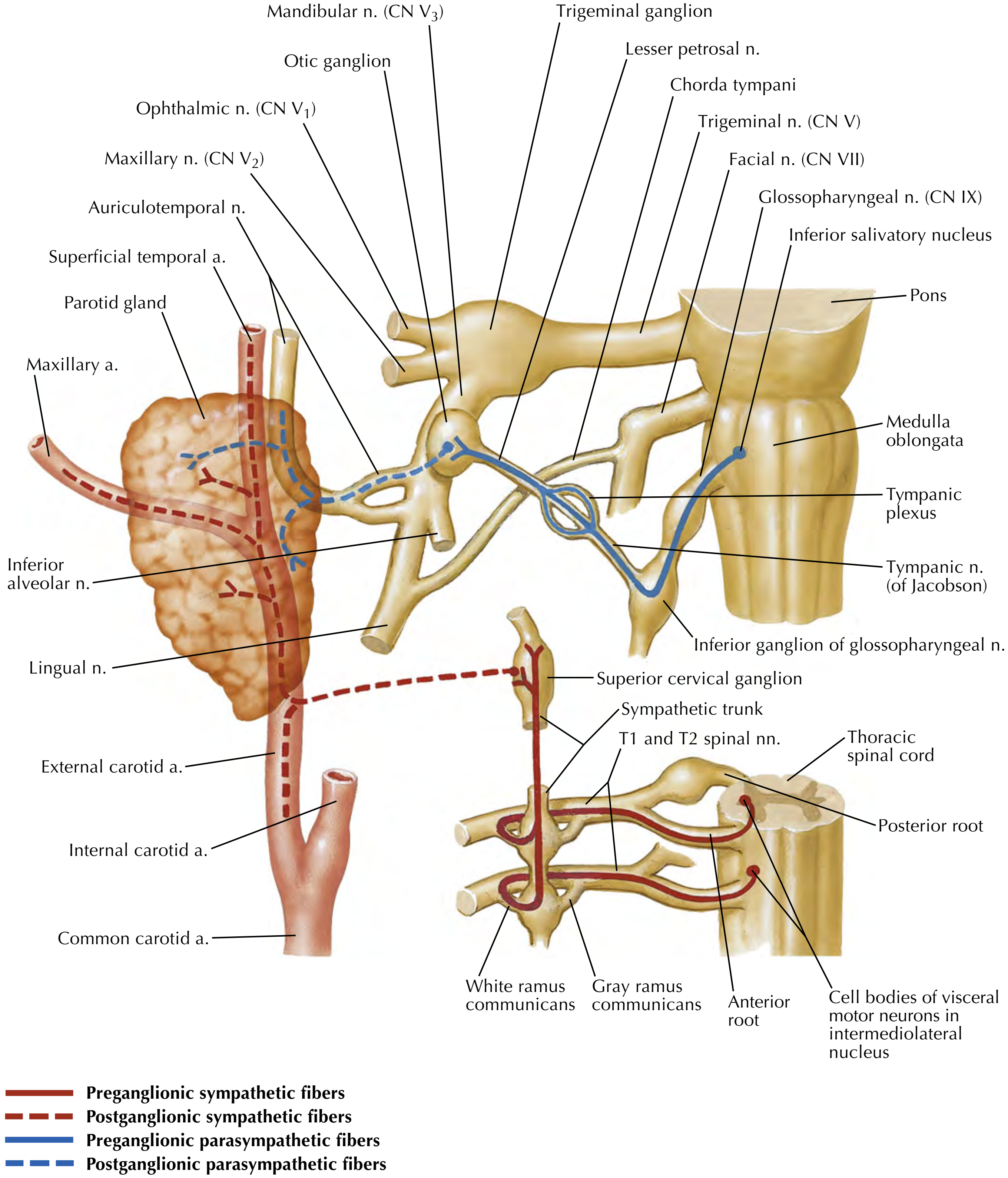
Pterygopalatine and Submandibular Ganglia: Schema

See also **Plates 77, 87, 111**


Ophthalmic n. (CN V_1)
Mandibular n. (CN V_3)
Otic ganglion
Lingual n.
Maxillary n. (CN V_2)
Nerve of pterygoid canal (Vidian n.)
Pterygopalatine ganglion
Lacrimal gland
Trigeminal ganglion
Deep petrosal n.
Greater petrosal n.
Chorda tympani
Trigeminal n. (CN V)
Facial n. (CN VII)
Superior salivatory nucleus
Palatine nn.
Nasopalatine n.
Pharyngeal n.
Maxillary a.
Internal carotid n.
Glossopharyngeal n. (CN IX)
Superior cervical ganglion
Sympathetic trunk
T1 and T2 spinal nn.
Greater palatine n.
Lesser palatine nn.
Submandibular ganglion
Thoracic spinal cord
Posterior root
Sublingual gland
Submandibular gland
Facial a.
Lingual a.
External carotid plexus
External carotid a.
Common carotid a.
Internal carotid a.
White rami communicantes
Gray rami communicantes
Anterior root
Cell bodies of visceral motor neurons in intermediolateral nucleus
F. Netter M.D.
Preganglionic sympathetic fibers
Postganglionic sympathetic fibers
Preganglionic parasympathetic fibers
Postganglionic parasympathetic fibers

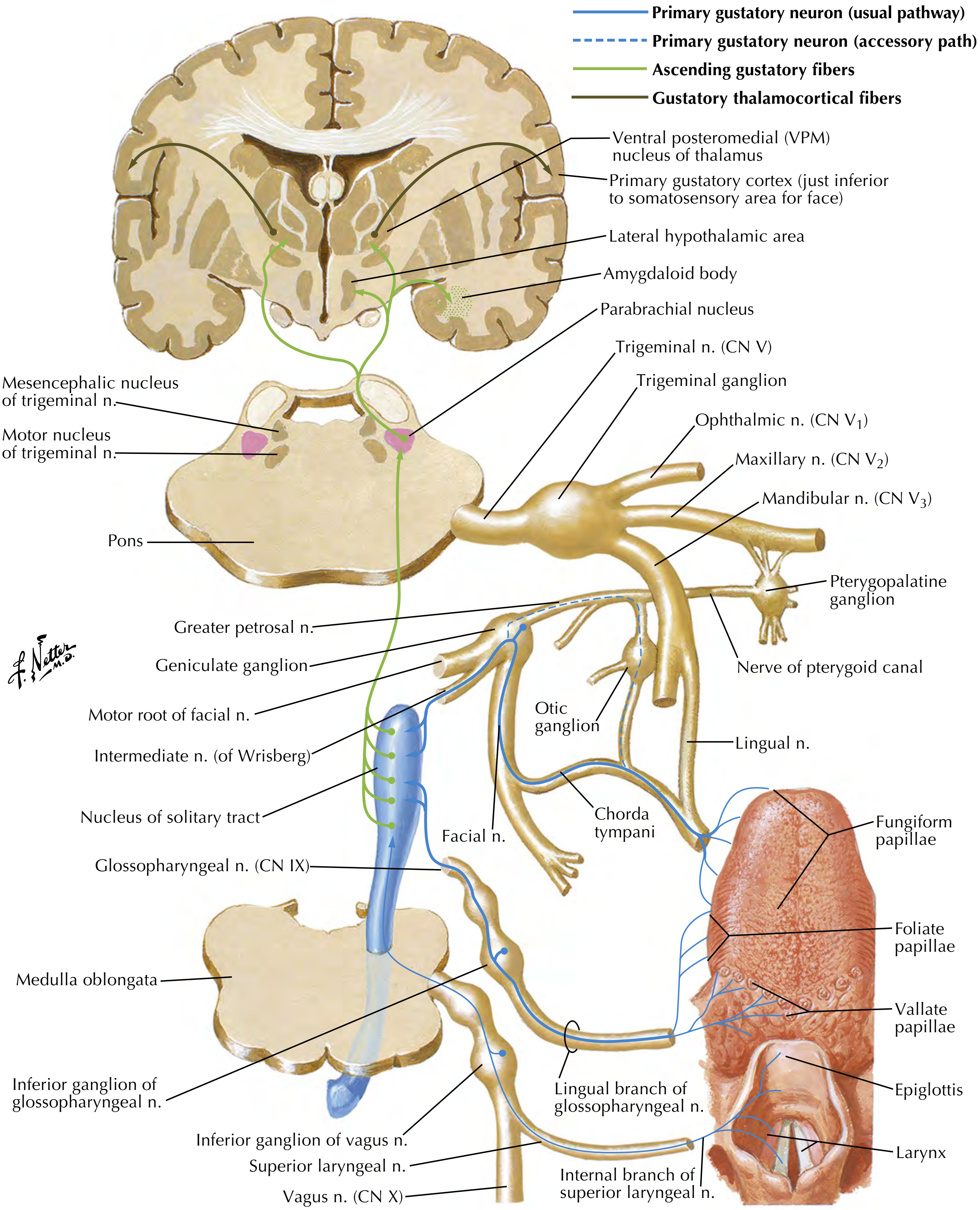
Otic Ganglion: Schema

See also **Plate 77**


Mandibular n. (CN V_3)
Trigeminal ganglion
Lesser petrosal n.
Otic ganglion
Chorda tympani
Ophthalmic n. (CN V_1)
Trigeminal n. (CN V)
Maxillary n. (CN V_2)
Facial n. (CN VII)
Glossopharyngeal n. (CN IX)
Auriculotemporal n.
Inferior salivatory nucleus
Superficial temporal a.
Pons
Parotid gland
Maxillary a.
Medulla oblongata
Tympanic plexus
Inferior alveolar n.
Tympanic n. (of Jacobson)
Inferior ganglion of glossopharyngeal n.
Lingual n.
Superior cervical ganglion
Sympathetic trunk
T1 and T2 spinal nn.
Thoracic spinal cord
External carotid a.
Posterior root
Internal carotid a.
Common carotid a.
White ramus communicans
Gray ramus communicans
Anterior root
Cell bodies of visceral motor neurons in intermediolateral nucleus
Preganglionic sympathetic fibers
Postganglionic sympathetic fibers
Preganglionic parasympathetic fibers
Postganglionic parasympathetic fibers

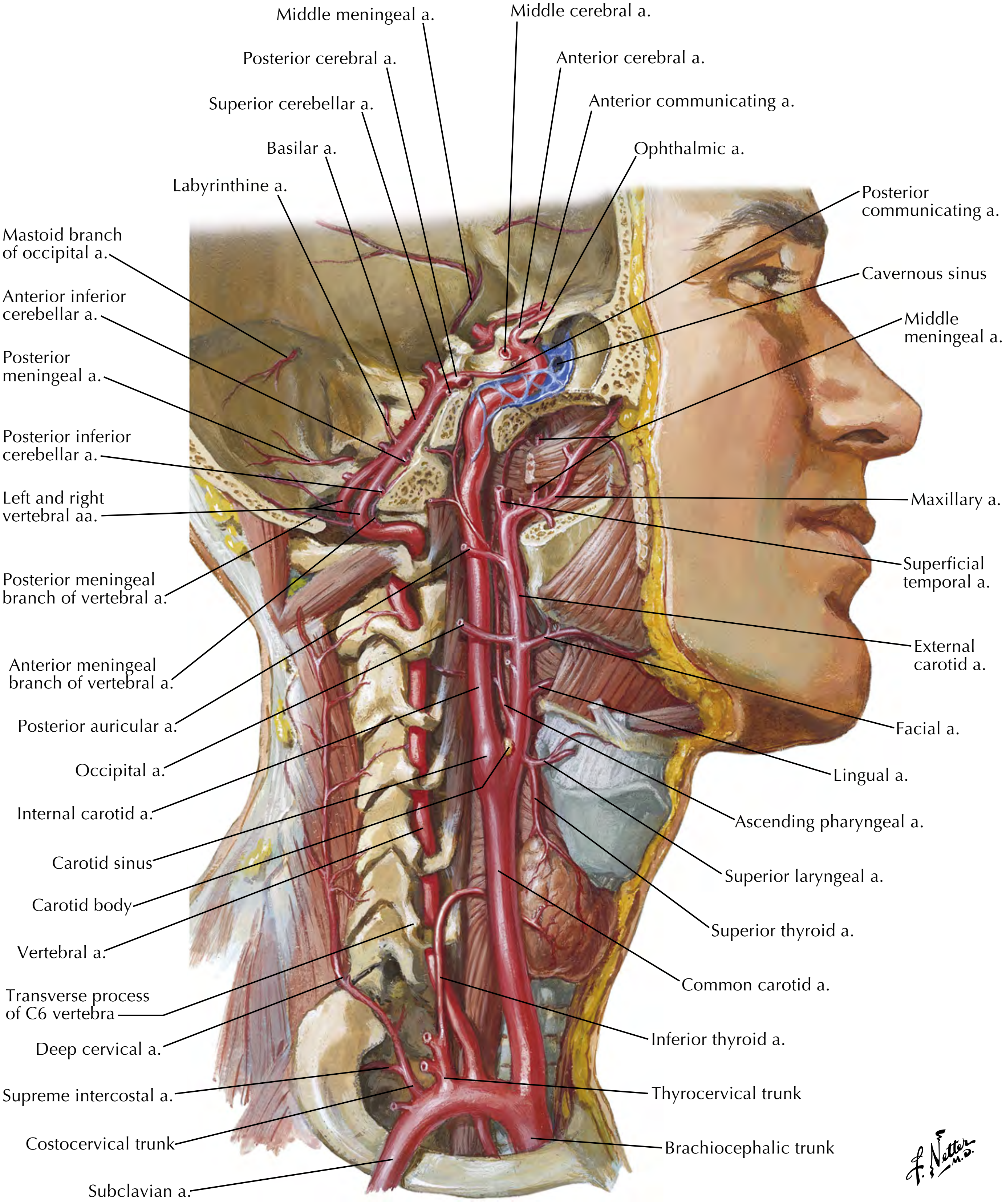
Taste Pathways: Schema

See also **Plates 150, 152**


Primary gustatory neuron (usual pathway)
Primary gustatory neuron (accessory path)
Ascending gustatory fibers
Gustatory thalamocortical fibers
Ventral posteromedial (VPM) nucleus of thalamus
Primary gustatory cortex (just inferior to somatosensory area for face)
Lateral hypothalamic area
Amygdaloid body
Parabrachial nucleus
Trigeminal n. (CN V)
Trigeminal ganglion
Ophthalmic n. (CN V1)
Maxillary n. (CN V2)
Mandibular n. (CN V3)
Mesencephalic nucleus of trigeminal n.
Motor nucleus of trigeminal n.
Pons
Pterygopalatine ganglion
Greater petrosal n.
Geniculate ganglion
Nerve of pterygoid canal
Motor root of facial n.
Otic ganglion
Intermediate n. (of Wrisberg)
Lingual n.
Nucleus of solitary tract
Chorda tympani
Fungiform papillae
Facial n.
Glossopharyngeal n. (CN IX)
Foliate papillae
Medulla oblongata
Vallate papillae
Inferior ganglion of glossopharyngeal n.
Lingual branch of glossopharyngeal n.
Epiglottis
Inferior ganglion of vagus n.
Superior laryngeal n.
Larynx
Internal branch of superior laryngeal n.
Vagus n. (CN X)
F. Netter M.D.

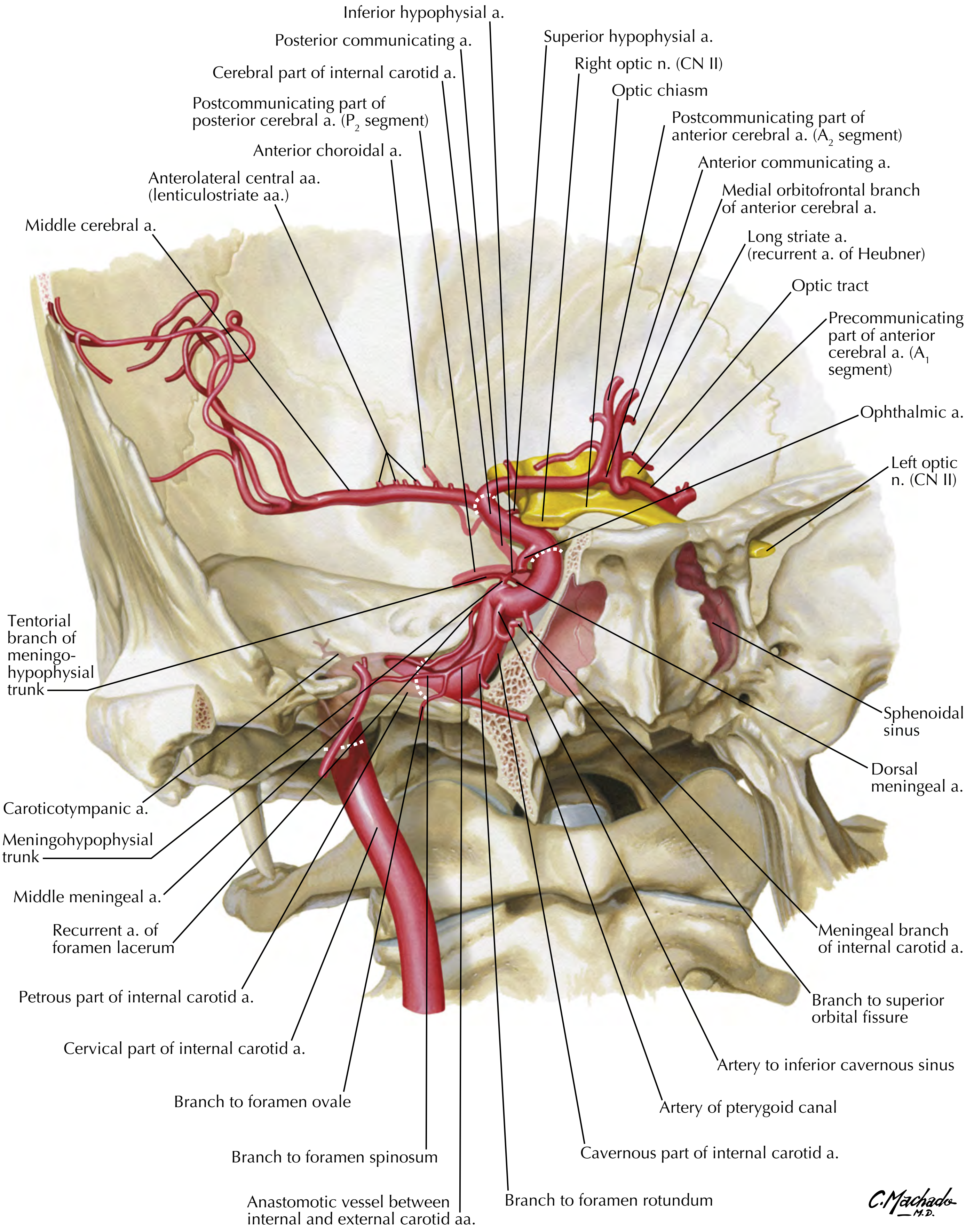
Arteries to Brain and Meninges

See also **Plates 58, 82, 164**

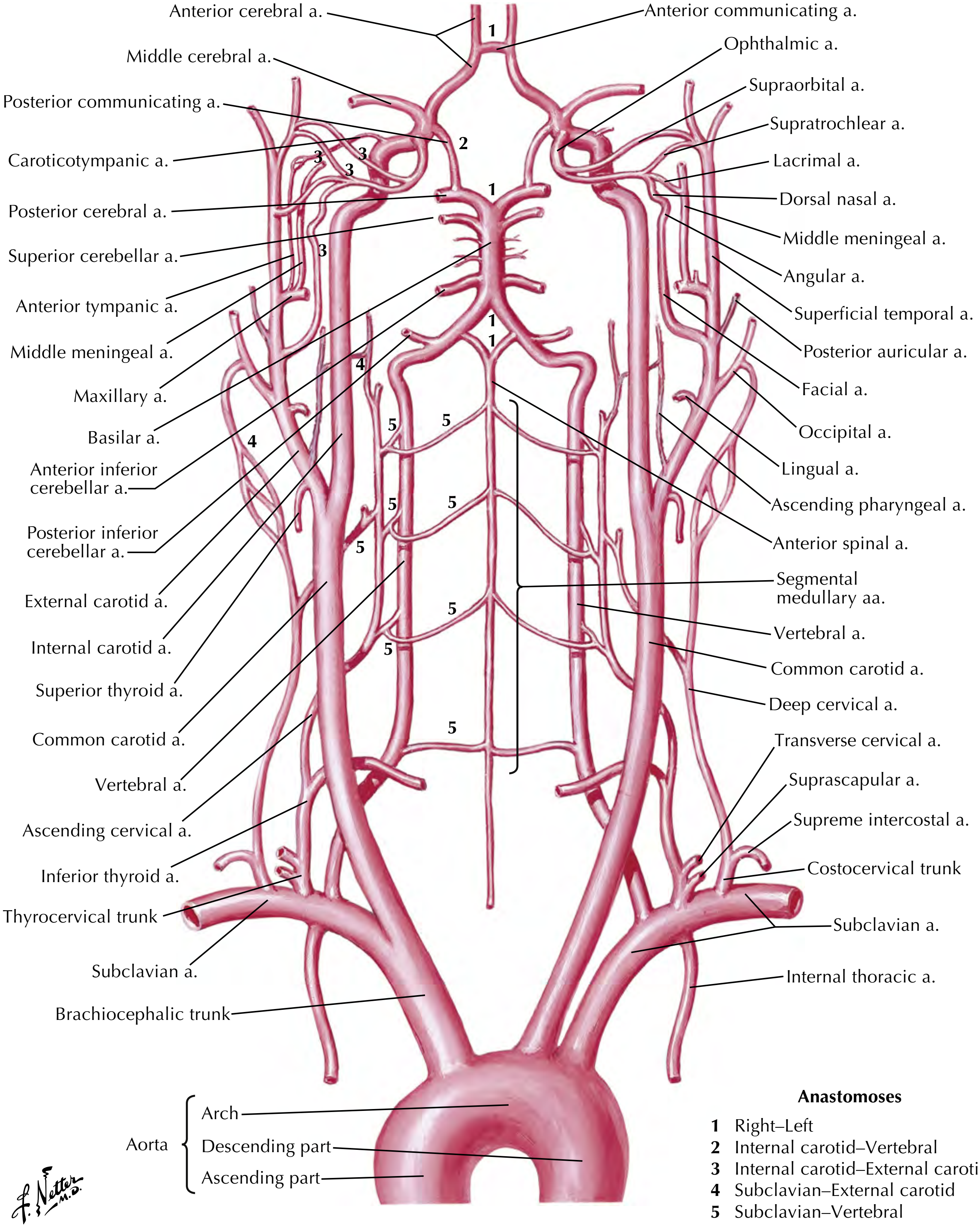

Middle meningeal a.
Middle cerebral a.
Posterior cerebral a.
Anterior cerebral a.
Superior cerebellar a.
Anterior communicating a.
Basilar a.
Ophthalmic a.
Labyrinthine a.
Posterior communicating a.
Mastoid branch of occipital a.
Cavernous sinus
Anterior inferior cerebellar a.
Middle meningeal a.
Posterior meningeal a.
Posterior inferior cerebellar a.
Left and right vertebral aa.
Maxillary a.
Superficial temporal a.
Posterior meningeal branch of vertebral a.
External carotid a.
Anterior meningeal branch of vertebral a.
Facial a.
Posterior auricular a.
Occipital a.
Lingual a.
Internal carotid a.
Ascending pharyngeal a.
Carotid sinus
Superior laryngeal a.
Carotid body
Superior thyroid a.
Vertebral a.
Common carotid a.
Transverse process of C6 vertebra
Inferior thyroid a.
Deep cervical a.
Thyrocervical trunk
Supreme intercostal a.
Brachiocephalic trunk
Costocervical trunk
Subclavian a.
F. Netter M.D.

Internal Carotid Artery in Petrous Part of Temporal Bone

See also **Plates 163, 166**


Inferior hypophysial a.
Posterior communicating a.
Cerebral part of internal carotid a.
Postcommunicating part of posterior cerebral a. (P_2 segment)
Anterior choroidal a.
Anterolateral central aa. (lenticulostriate aa.)
Middle cerebral a.
Superior hypophysial a.
Right optic n. (CN II)
Optic chiasm
Postcommunicating part of anterior cerebral a. (A_2 segment)
Anterior communicating a.
Medial orbitofrontal branch of anterior cerebral a.
Long striate a. (recurrent a. of Heubner)
Optic tract
Precommunicating part of anterior cerebral a. (A_1 segment)
Ophthalmic a.
Left optic n. (CN II)
Tentorial branch of meningo-hypophysial trunk
Sphenoidal sinus
Dorsal meningeal a.
Caroticotympanic a.
Meningohypophysial trunk
Middle meningeal a.
Recurrent a. of foramen lacerum
Meningeal branch of internal carotid a.
Petrous part of internal carotid a.
Branch to superior orbital fissure
Cervical part of internal carotid a.
Artery to inferior cavernous sinus
Branch to foramen ovale
Artery of pterygoid canal
Branch to foramen spinosum
Cavernous part of internal carotid a.
Anastomotic vessel between internal and external carotid aa.
Branch to foramen rotundum
C.Machado M.D.

Arteries to Brain: Schema

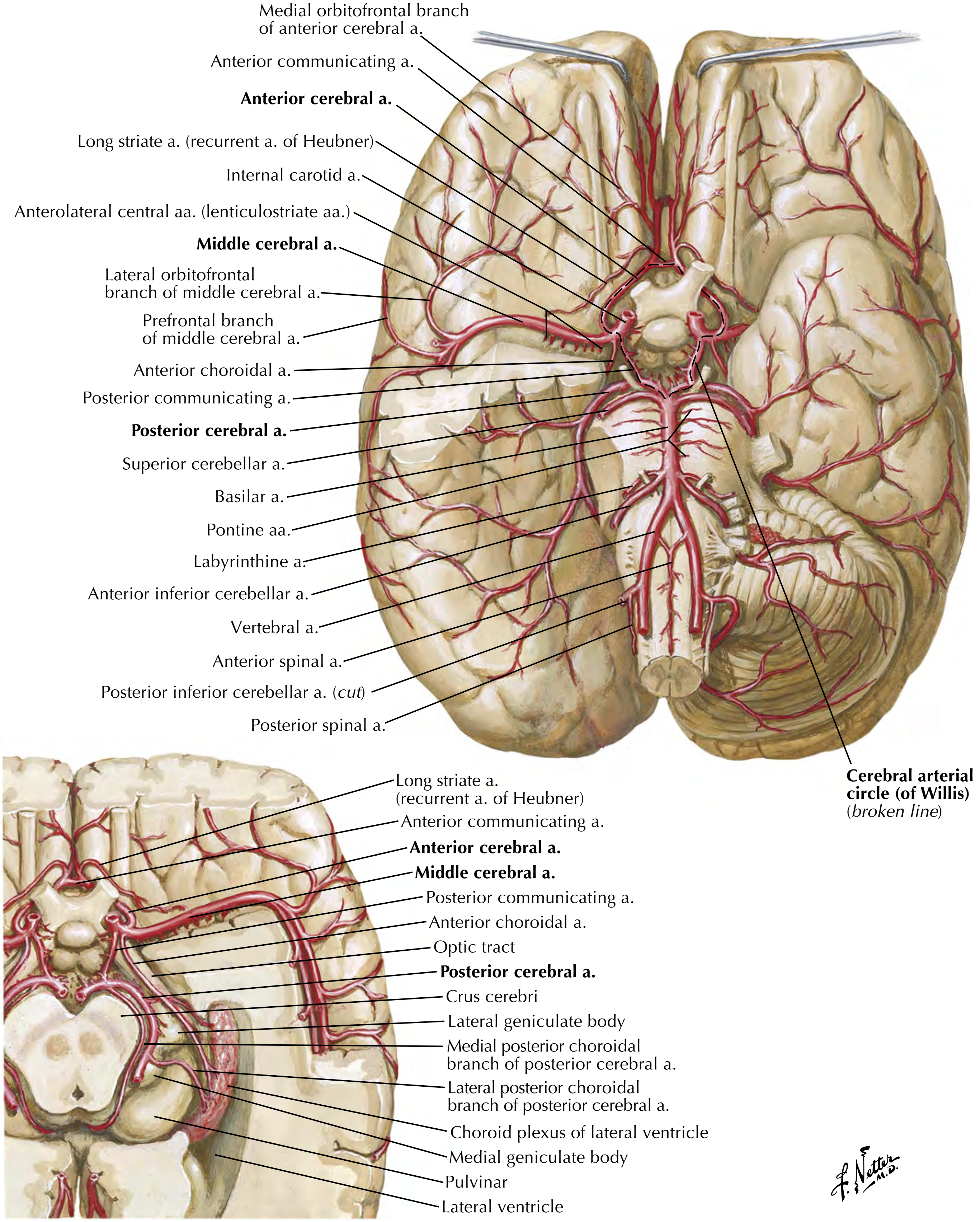

Anterior cerebral a.
Middle cerebral a.
Posterior communicating a.
Caroticotympanic a.
Posterior cerebral a.
Superior cerebellar a.
Anterior tympanic a.
Middle meningeal a.
Maxillary a.
Basilar a.
Anterior inferior cerebellar a.
Posterior inferior cerebellar a.
External carotid a.
Internal carotid a.
Superior thyroid a.
Common carotid a.
Vertebral a.
Ascending cervical a.
Inferior thyroid a.
Thyrocervical trunk
Subclavian a.
Brachiocephalic trunk
Aorta
Arch
Descending part
Ascending part
Anterior communicating a.
Ophthalmic a.
Supraorbital a.
Supratrochlear a.
Lacrimal a.
Dorsal nasal a.
Middle meningeal a.
Angular a.
Superficial temporal a.
Posterior auricular a.
Facial a.
Occipital a.
Lingual a.
Ascending pharyngeal a.
Anterior spinal a.
Segmental medullary aa.
Vertebral a.
Common carotid a.
Deep cervical a.
Transverse cervical a.
Suprascapular a.
Supreme intercostal a.
Costocervical trunk
Subclavian a.
Internal thoracic a.
1
1
1
1
2
3
3
3
3
4
4
5
5
5
5
5
5
5
5
5

Anastomoses

1 Right–Left
2 Internal carotid–Vertebral
3 Internal carotid–External carotid
4 Subclavian–External carotid
5 Subclavian–Vertebral

Arteries of Brain: Inferior Views

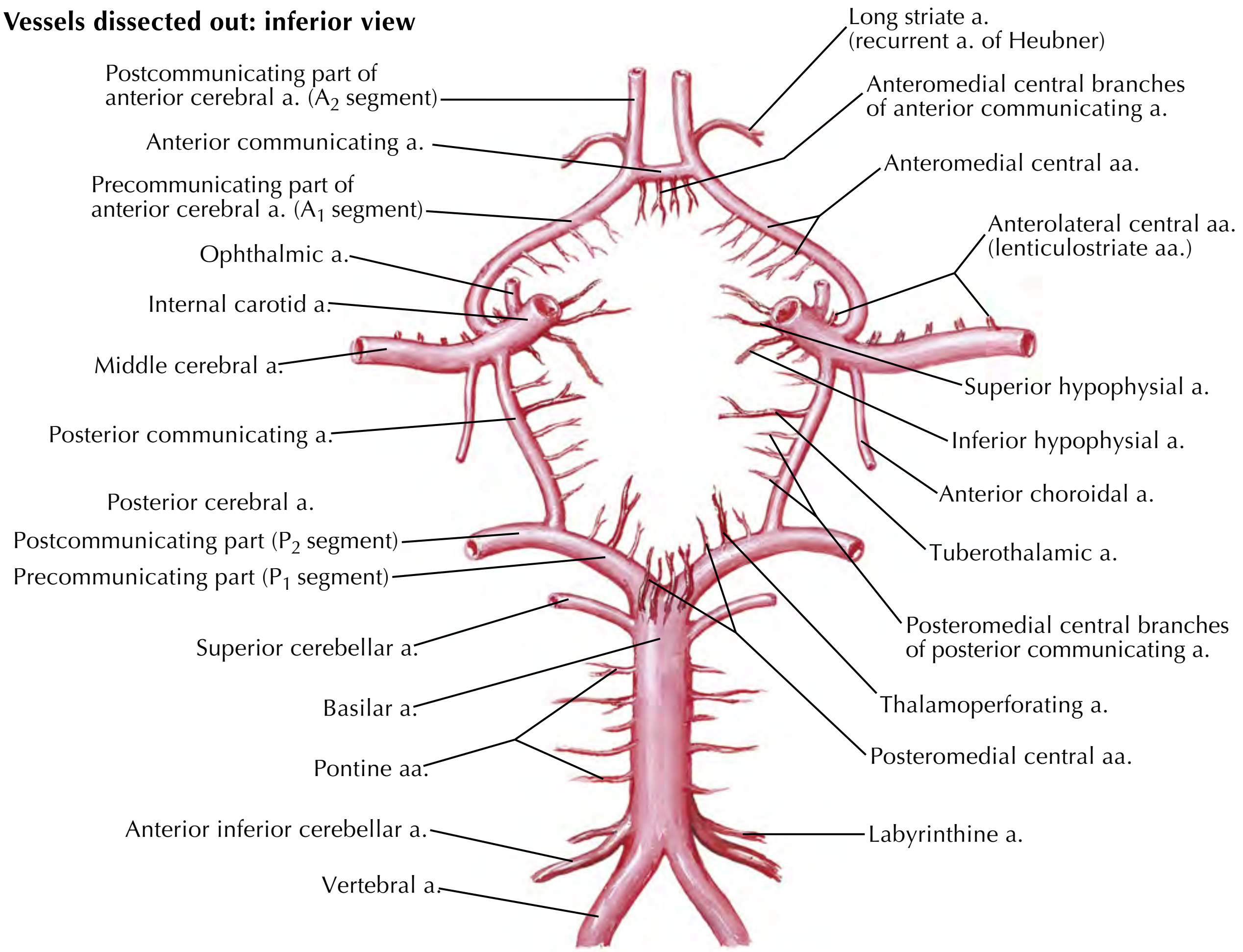
See also **Plates 164, 167**


Medial orbitofrontal branch of anterior cerebral a.
Anterior communicating a.
Anterior cerebral a.
Long striate a. (recurrent a. of Heubner)
Internal carotid a.
Anterolateral central aa. (lenticulostriate aa.)
Middle cerebral a.
Lateral orbitofrontal branch of middle cerebral a.
Prefrontal branch of middle cerebral a.
Anterior choroidal a.
Posterior communicating a.
Posterior cerebral a.
Superior cerebellar a.
Basilar a.
Pontine aa.
Labyrinthine a.
Anterior inferior cerebellar a.
Vertebral a.
Anterior spinal a.
Posterior inferior cerebellar a. (*cut*)
Posterior spinal a.
Cerebral arterial circle (of Willis)
(*broken line*)
Long striate a. (recurrent a. of Heubner)
Anterior communicating a.
Anterior cerebral a.
Middle cerebral a.
Posterior communicating a.
Anterior choroidal a.
Optic tract
Posterior cerebral a.
Crus cerebri
Lateral geniculate body
Medial posterior choroidal branch of posterior cerebral a.
Lateral posterior choroidal branch of posterior cerebral a.
Choroid plexus of lateral ventricle
Medial geniculate body
Pulvinar
Lateral ventricle
F. Netter M.D.

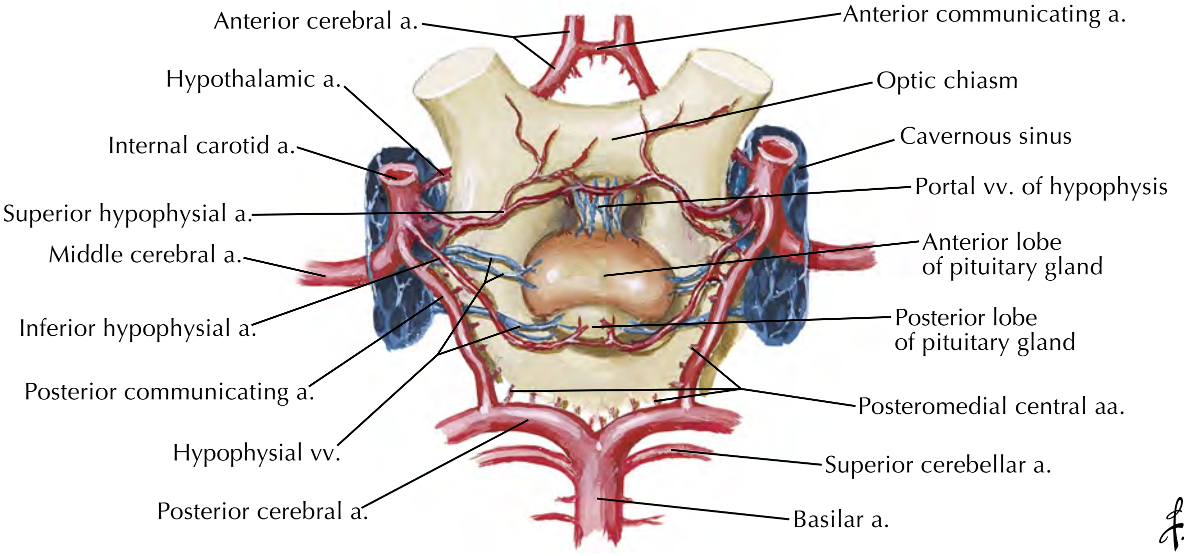
Cerebral Arterial Circle (of Willis)

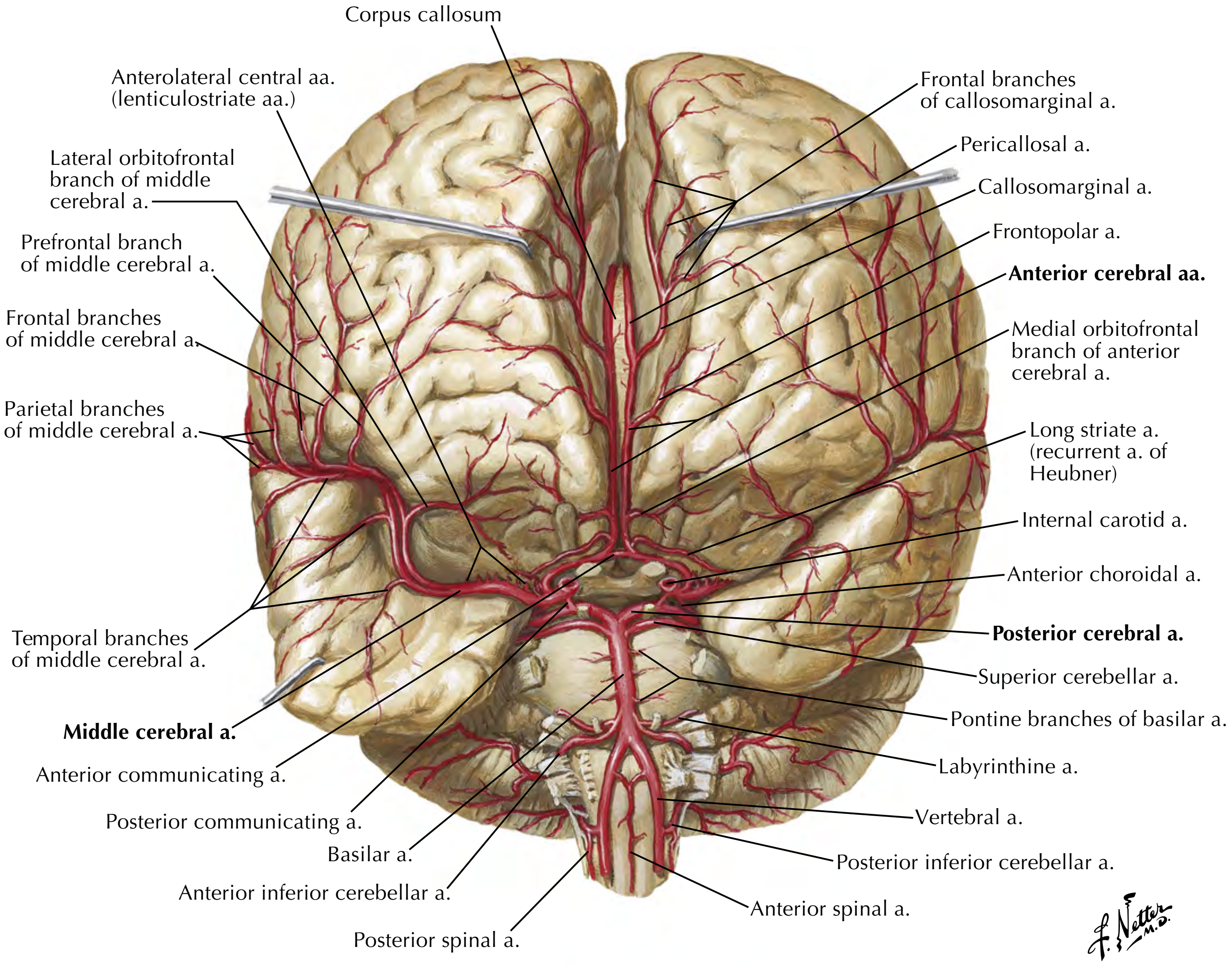
See also **Plate 166**

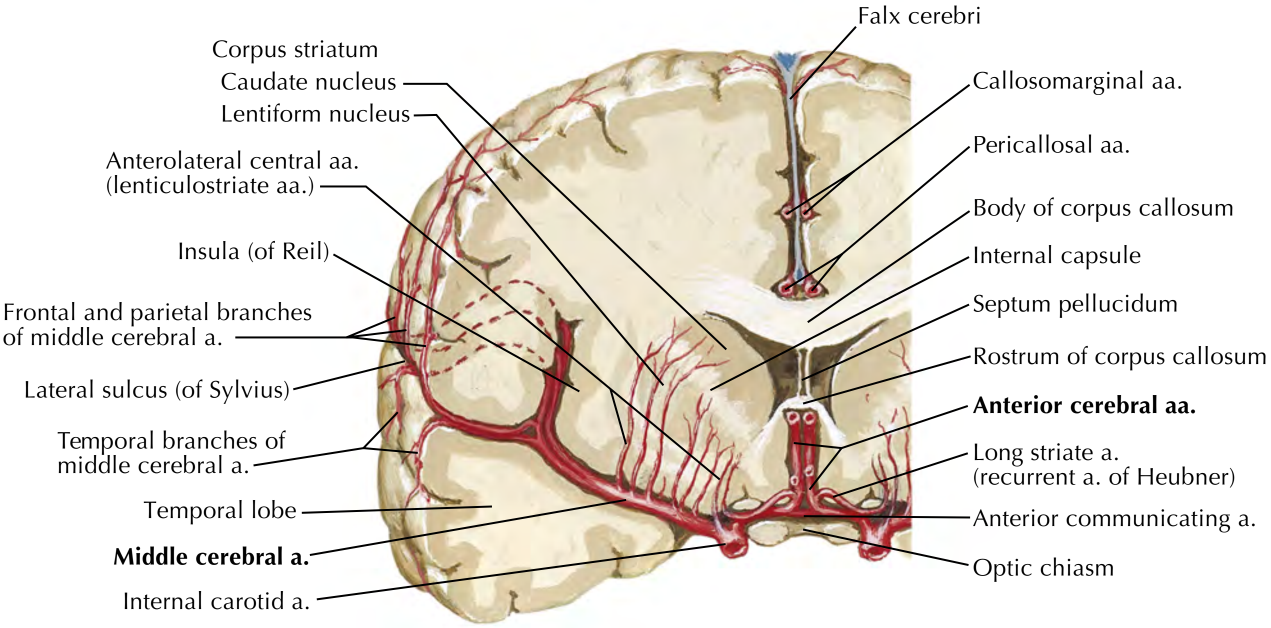
Vessels dissected out: inferior view


Postcommunicating part of anterior cerebral a. (A_2 segment)
Anterior communicating a.
Precommunicating part of anterior cerebral a. (A_1 segment)
Ophthalmic a.
Internal carotid a.
Middle cerebral a.
Posterior communicating a.
Posterior cerebral a.
Postcommunicating part (P_2 segment)
Precommunicating part (P_1 segment)
Superior cerebellar a.
Basilar a.
Pontine aa.
Anterior inferior cerebellar a.
Vertebral a.
Long striate a. (recurrent a. of Heubner)
Anteromedial central branches of anterior communicating a.
Anteromedial central aa.
Anterolateral central aa. (lenticulostriate aa.)
Superior hypophysial a.
Inferior hypophysial a.
Anterior choroidal a.
Tuberothalamic a.
Posteromedial central branches of posterior communicating a.
Thalamoperforating a.
Posteromedial central aa.
Labyrinthine a.

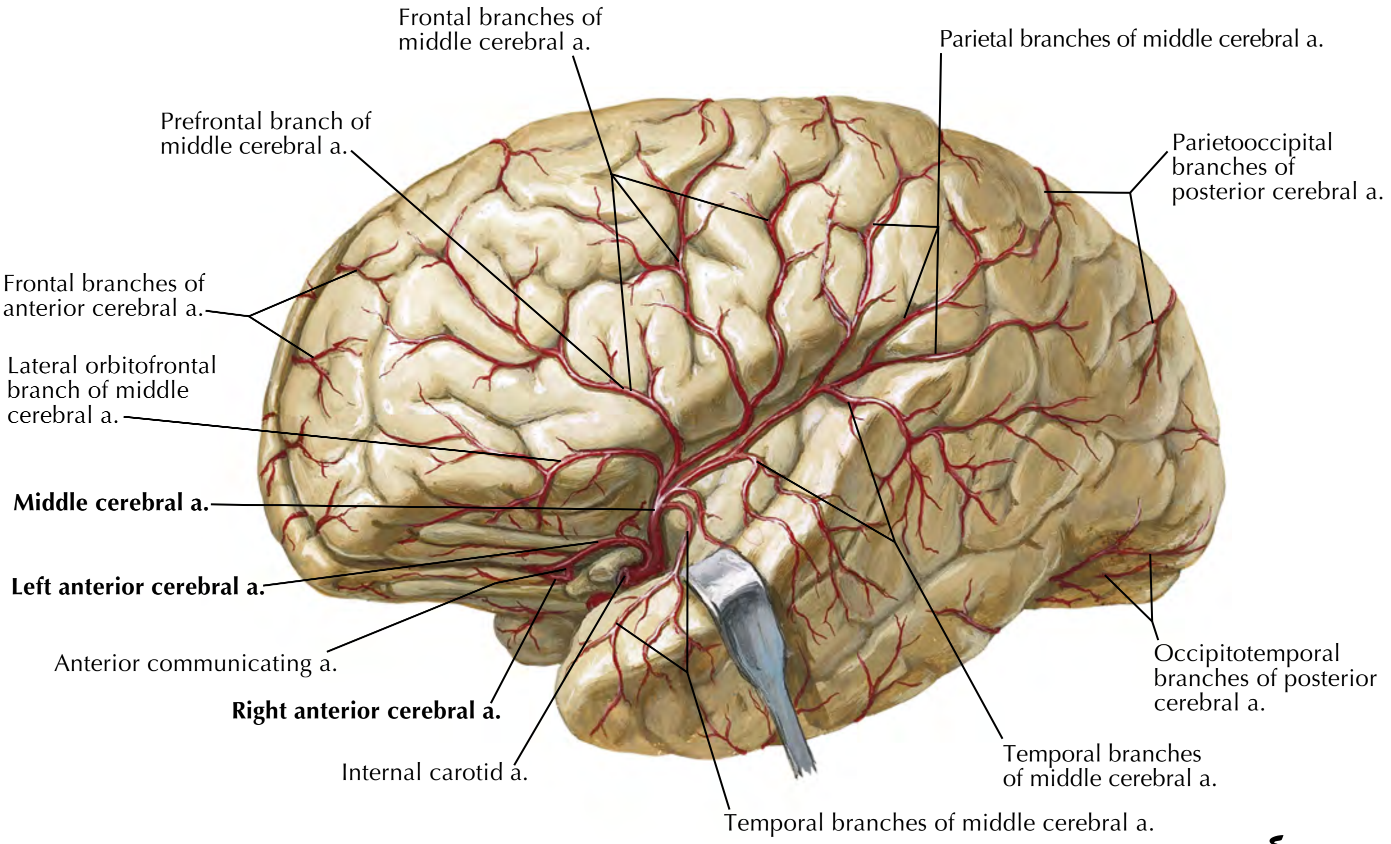
Vessels in situ: inferior view

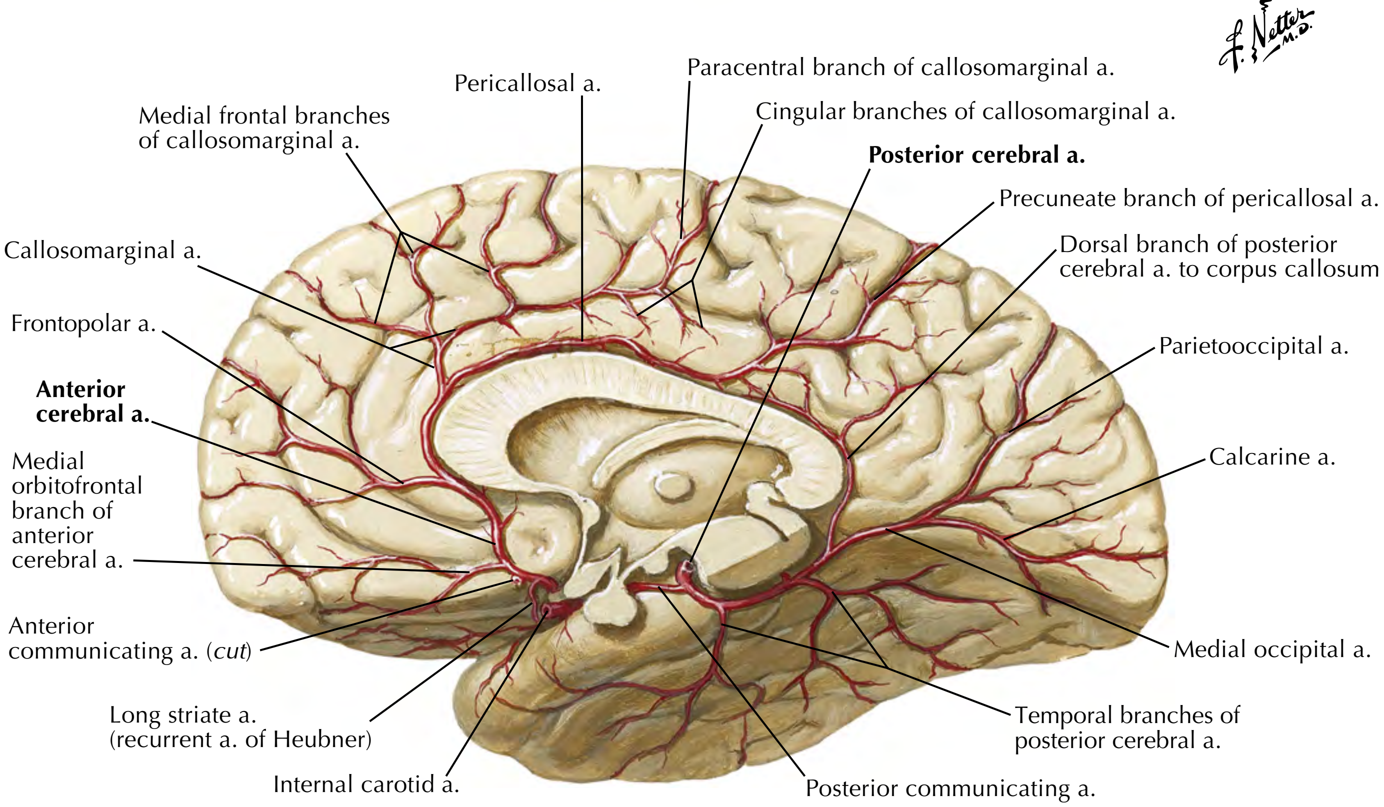

Anterior cerebral a.
Hypothalamic a.
Internal carotid a.
Superior hypophysial a.
Middle cerebral a.
Inferior hypophysial a.
Posterior communicating a.
Hypophysial vv.
Posterior cerebral a.
Anterior communicating a.
Optic chiasm
Cavernous sinus
Portal vv. of hypophysis
Anterior lobe of pituitary gland
Posterior lobe of pituitary gland
Posteromedial central aa.
Superior cerebellar a.
Basilar a.


Corpus callosum
Anterolateral central aa. (lenticulostriate aa.)
Lateral orbitofrontal branch of middle cerebral a.
Prefrontal branch of middle cerebral a.
Frontal branches of middle cerebral a.
Parietal branches of middle cerebral a.
Temporal branches of middle cerebral a.
Middle cerebral a.
Anterior communicating a.
Posterior communicating a.
Basilar a.
Anterior inferior cerebellar a.
Posterior spinal a.
Frontal branches of callosomarginal a.
Pericallosal a.
Callosomarginal a.
Frontopolar a.
Anterior cerebral aa.
Medial orbitofrontal branch of anterior cerebral a.
Long striate a. (recurrent a. of Heubner)
Internal carotid a.
Anterior choroidal a.
Posterior cerebral a.
Superior cerebellar a.
Pontine branches of basilar a.
Labyrinthine a.
Vertebral a.
Posterior inferior cerebellar a.
Anterior spinal a.
F. Netter M.D.

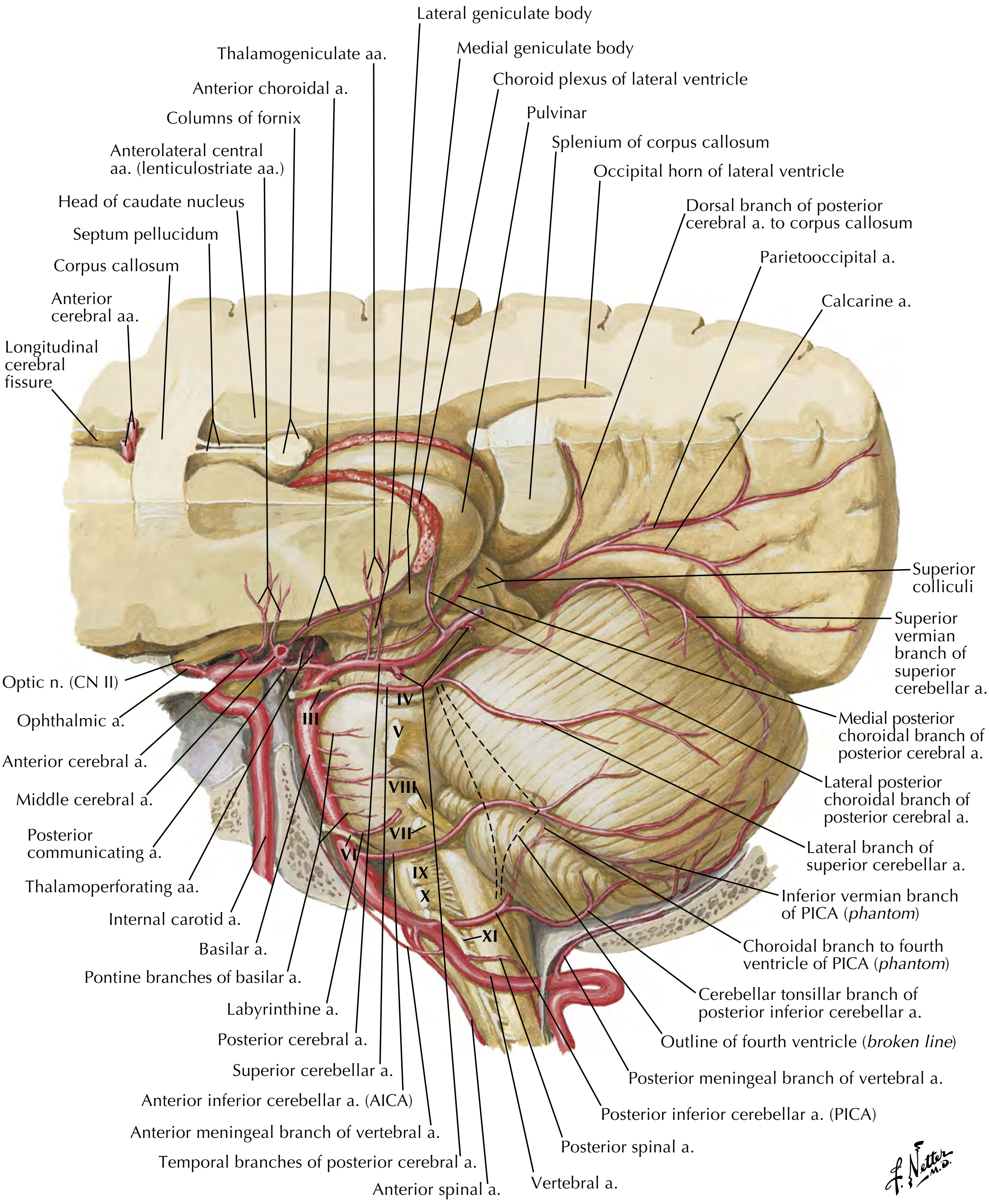

Falx cerebri
Corpus striatum
Caudate nucleus
Lentiform nucleus
Anterolateral central aa. (lenticulostriate aa.)
Insula (of Reil)
Frontal and parietal branches of middle cerebral a.
Lateral sulcus (of Sylvius)
Temporal branches of middle cerebral a.
Temporal lobe
Middle cerebral a.
Internal carotid a.
Callosomarginal aa.
Pericallosal aa.
Body of corpus callosum
Internal capsule
Septum pellucidum
Rostrum of corpus callosum
Anterior cerebral aa.
Long striate a. (recurrent a. of Heubner)
Anterior communicating a.
Optic chiasm

Arteries of Brain: Lateral and Medial Views

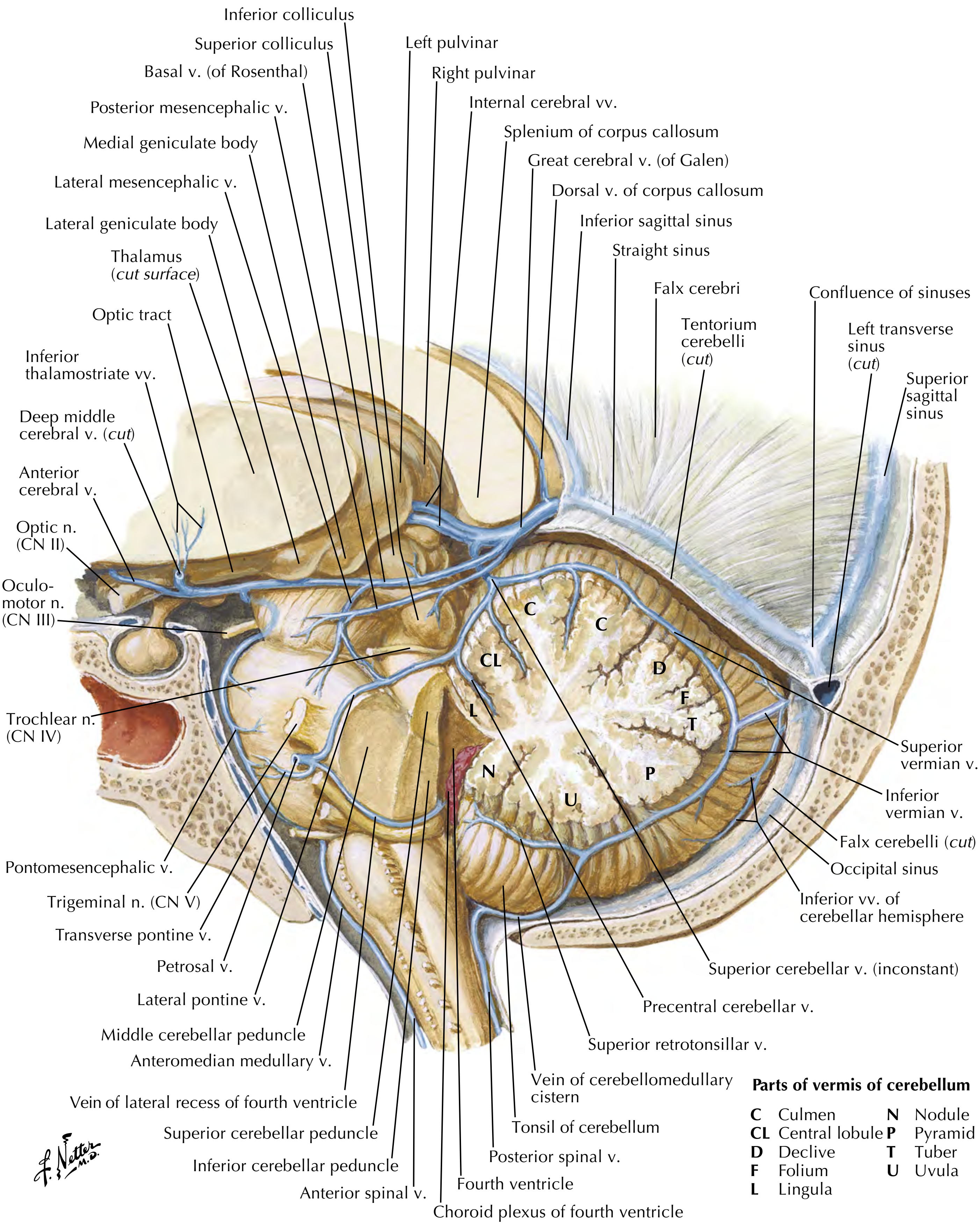

Frontal branches of middle cerebral a.
Parietal branches of middle cerebral a.
Prefrontal branch of middle cerebral a.
Parietooccipital branches of posterior cerebral a.
Frontal branches of anterior cerebral a.
Lateral orbitofrontal branch of middle cerebral a.
Middle cerebral a.
Left anterior cerebral a.
Anterior communicating a.
Right anterior cerebral a.
Internal carotid a.
Occipitotemporal branches of posterior cerebral a.
Temporal branches of middle cerebral a.
Temporal branches of middle cerebral a.
F. Netter M.D.


Paracentral branch of callosomarginal a.
Pericallosal a.
Cingular branches of callosomarginal a.
Medial frontal branches of callosomarginal a.
Posterior cerebral a.
Precuneate branch of pericallosal a.
Callosomarginal a.
Dorsal branch of posterior cerebral a. to corpus callosum
Frontopolar a.
Parietooccipital a.
Anterior cerebral a.
Calcarine a.
Medial orbitofrontal branch of anterior cerebral a.
Anterior communicating a. (*cut*)
Medial occipital a.
Long striate a. (recurrent a. of Heubner)
Temporal branches of posterior cerebral a.
Internal carotid a.
Posterior communicating a.

Arteries of Brain: Branches of Vertebral and Basilar Arteries


Lateral geniculate body
Thalamogeniculate aa.
Medial geniculate body
Anterior choroidal a.
Choroid plexus of lateral ventricle
Columns of fornix
Pulvinar
Anterolateral central aa. (lenticulostriate aa.)
Splenium of corpus callosum
Occipital horn of lateral ventricle
Head of caudate nucleus
Dorsal branch of posterior cerebral a. to corpus callosum
Septum pellucidum
Corpus callosum
Parietooccipital a.
Anterior cerebral aa.
Calcarine a.
Longitudinal cerebral fissure
Superior colliculi
Superior vermian branch of superior cerebellar a.
Optic n. (CN II)
IV
III
V
Ophthalmic a.
Medial posterior choroidal branch of posterior cerebral a.
Anterior cerebral a.
VIII
Middle cerebral a.
Lateral posterior choroidal branch of posterior cerebral a.
VII
Posterior communicating a.
VI
Lateral branch of superior cerebellar a.
IX
Thalamoperforating aa.
X
Inferior vermian branch of PICA (*phantom*)
Internal carotid a.
XI
Basilar a.
Choroidal branch to fourth ventricle of PICA (*phantom*)
Pontine branches of basilar a.
Cerebellar tonsillar branch of posterior inferior cerebellar a.
Labyrinthine a.
Outline of fourth ventricle (*broken line*)
Posterior cerebral a.
Superior cerebellar a.
Posterior meningeal branch of vertebral a.
Anterior inferior cerebellar a. (AICA)
Posterior inferior cerebellar a. (PICA)
Anterior meningeal branch of vertebral a.
Posterior spinal a.
Temporal branches of posterior cerebral a.
Vertebral a.
Anterior spinal a.
F. Netter M.D.

See also **Plate 173**

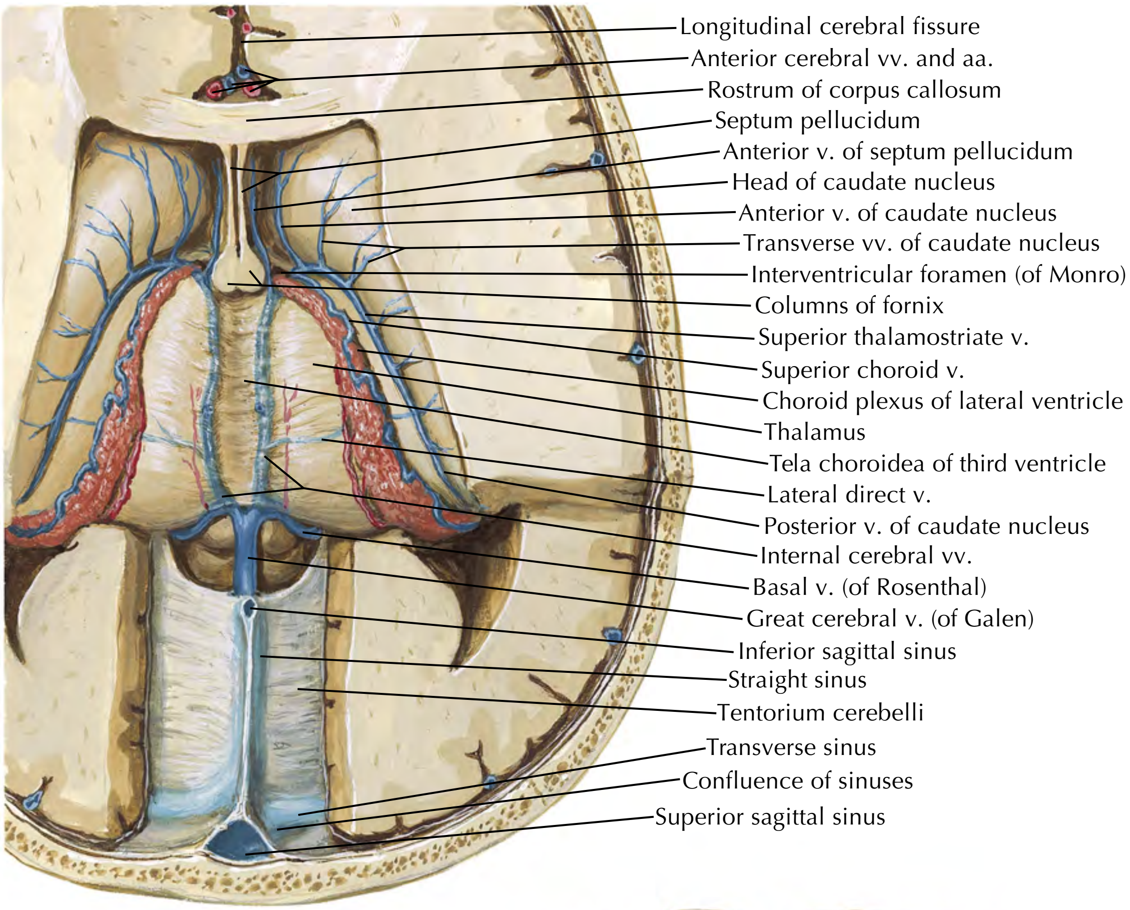

Inferior colliculus
Superior colliculus
Basal v. (of Rosenthal)
Posterior mesencephalic v.
Medial geniculate body
Lateral mesencephalic v.
Lateral geniculate body
Thalamus (*cut surface*)
Optic tract
Inferior thalamostriate vv.
Deep middle cerebral v. (*cut*)
Anterior cerebral v.
Optic n. (CN II)
Oculomotor n. (CN III)
Trochlear n. (CN IV)
Pontomesencephalic v.
Trigeminal n. (CN V)
Transverse pontine v.
Petrosal v.
Lateral pontine v.
Middle cerebellar peduncle
Anteromedian medullary v.
Vein of lateral recess of fourth ventricle
Superior cerebellar peduncle
Inferior cerebellar peduncle
Anterior spinal v.
Choroid plexus of fourth ventricle
Fourth ventricle
Posterior spinal v.
Tonsil of cerebellum
Vein of cerebellomedullary cistern
Superior retrotonsillar v.
Precentral cerebellar v.
Superior cerebellar v. (inconstant)
Inferior vv. of cerebellar hemisphere
Occipital sinus
Falx cerebelli (*cut*)
Inferior vermian v.
Superior vermian v.
Superior sagittal sinus
Left transverse sinus (*cut*)
Confluence of sinuses
Tentorium cerebelli (*cut*)
Falx cerebri
Straight sinus
Inferior sagittal sinus
Dorsal v. of corpus callosum
Great cerebral v. (of Galen)
Splenium of corpus callosum
Internal cerebral vv.
Right pulvinar
Left pulvinar
C
C
CL
D
F
T
L
N
U
P

Parts of vermis of cerebellum

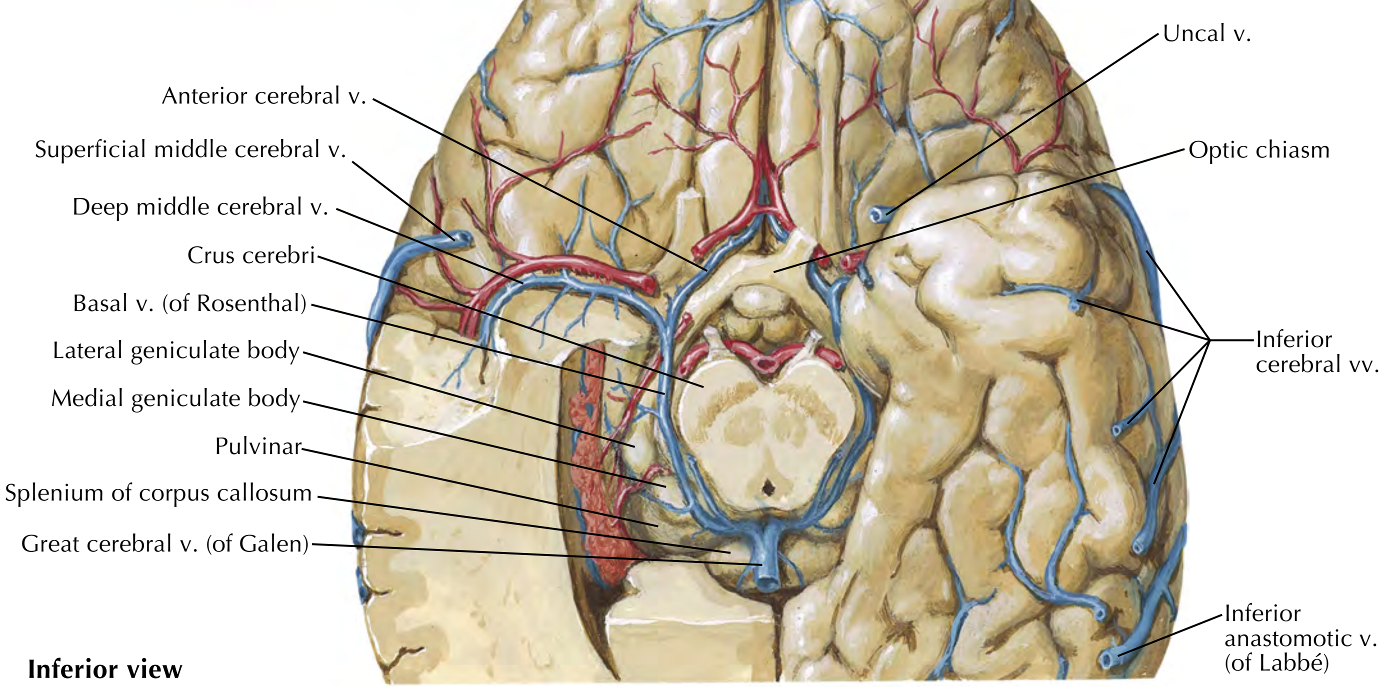
C	Culmen	**N**	Nodule
CL	Central lobule	**P**	Pyramid
D	Declive	**T**	Tuber
F	Folium	**U**	Uvula
L	Lingula		

Deep Veins of Brain

For superficial veins of brain see **Plates 138, 173**

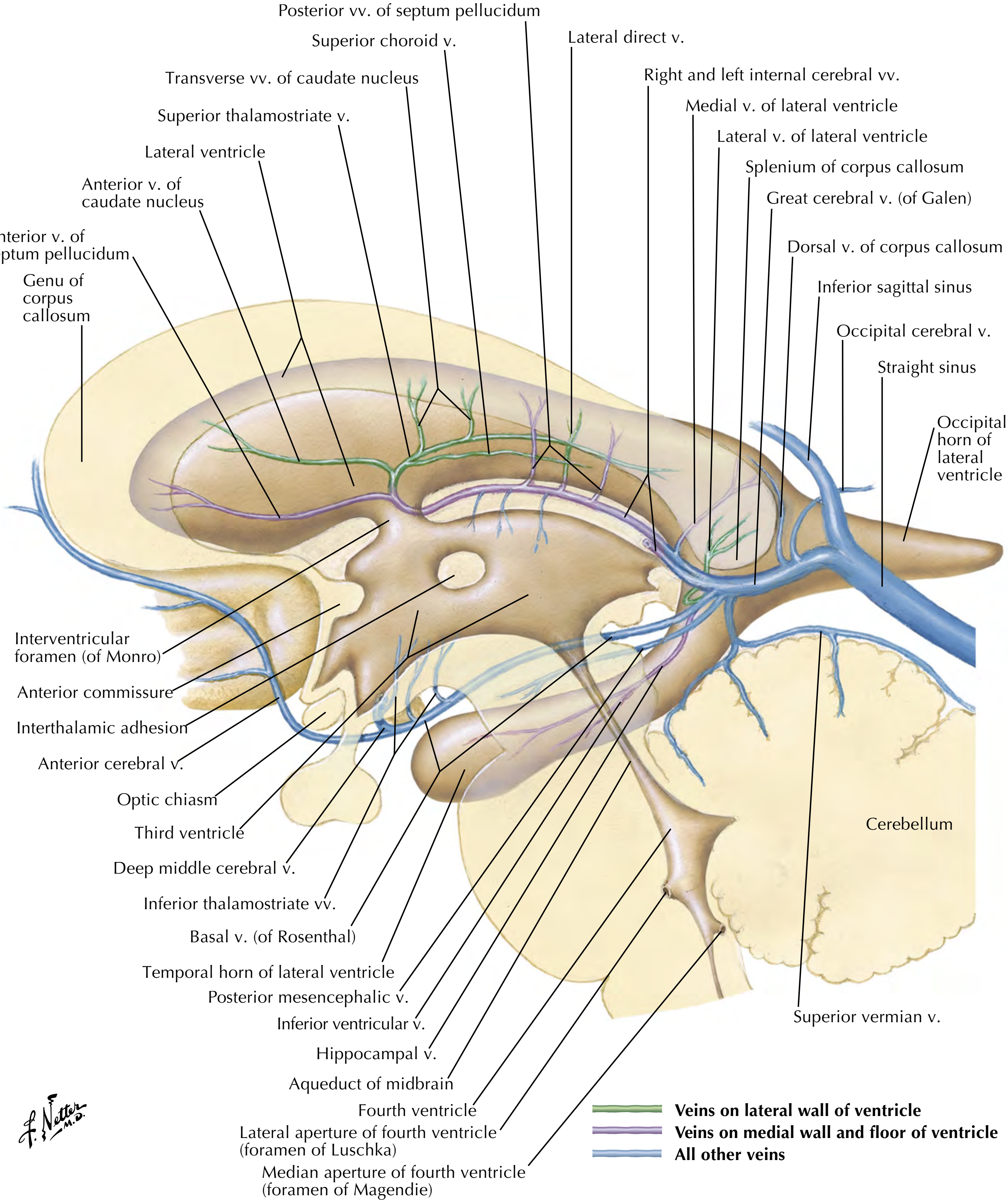

Longitudinal cerebral fissure
Anterior cerebral vv. and aa.
Rostrum of corpus callosum
Septum pellucidum
Anterior v. of septum pellucidum
Head of caudate nucleus
Anterior v. of caudate nucleus
Transverse vv. of caudate nucleus
Interventricular foramen (of Monro)
Columns of fornix
Superior thalamostriate v.
Superior choroid v.
Choroid plexus of lateral ventricle
Thalamus
Tela choroidea of third ventricle
Lateral direct v.
Posterior v. of caudate nucleus
Internal cerebral vv.
Basal v. (of Rosenthal)
Great cerebral v. (of Galen)
Inferior sagittal sinus
Straight sinus
Tentorium cerebelli
Transverse sinus
Confluence of sinuses
Superior sagittal sinus

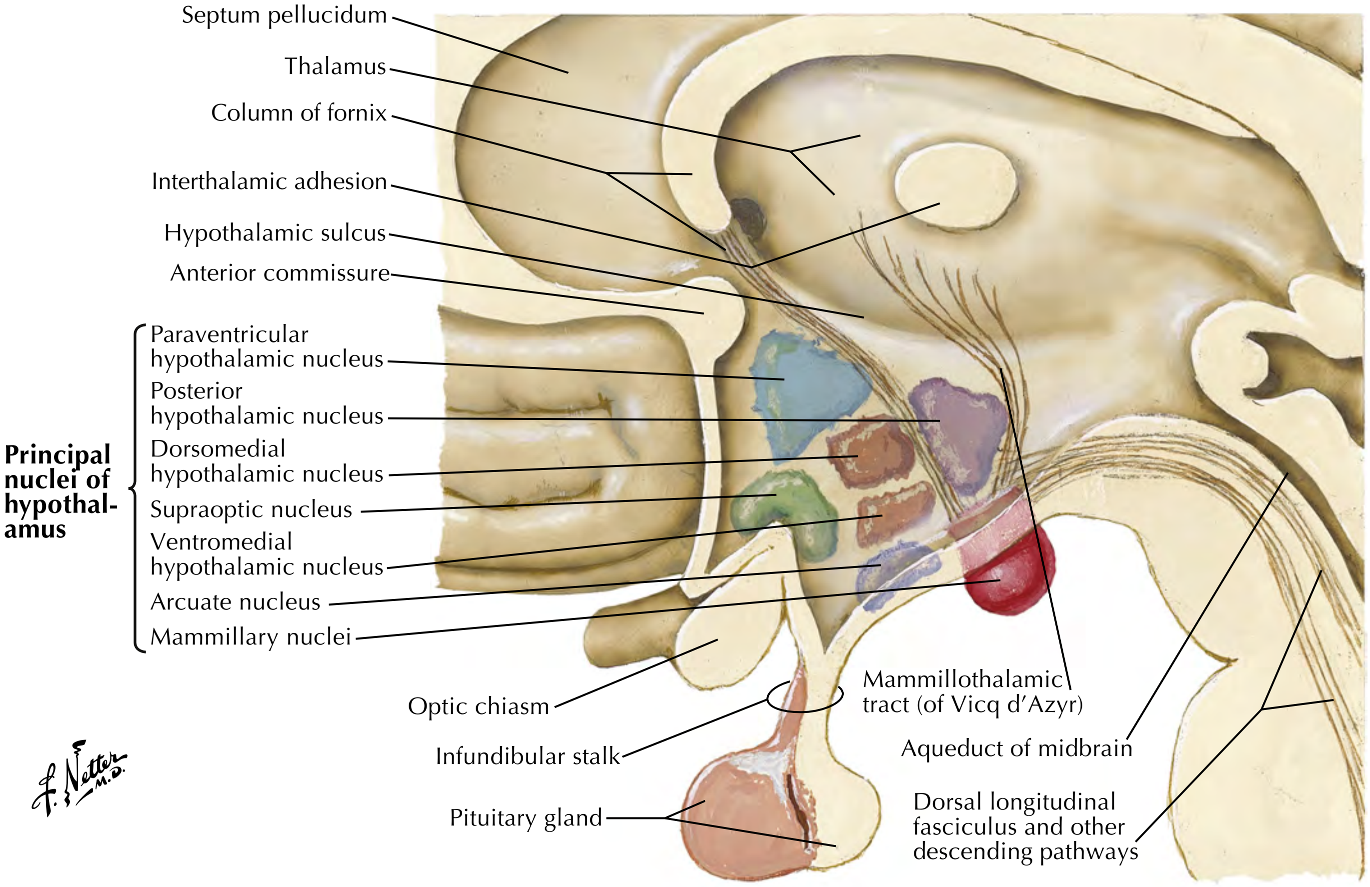
Superior view

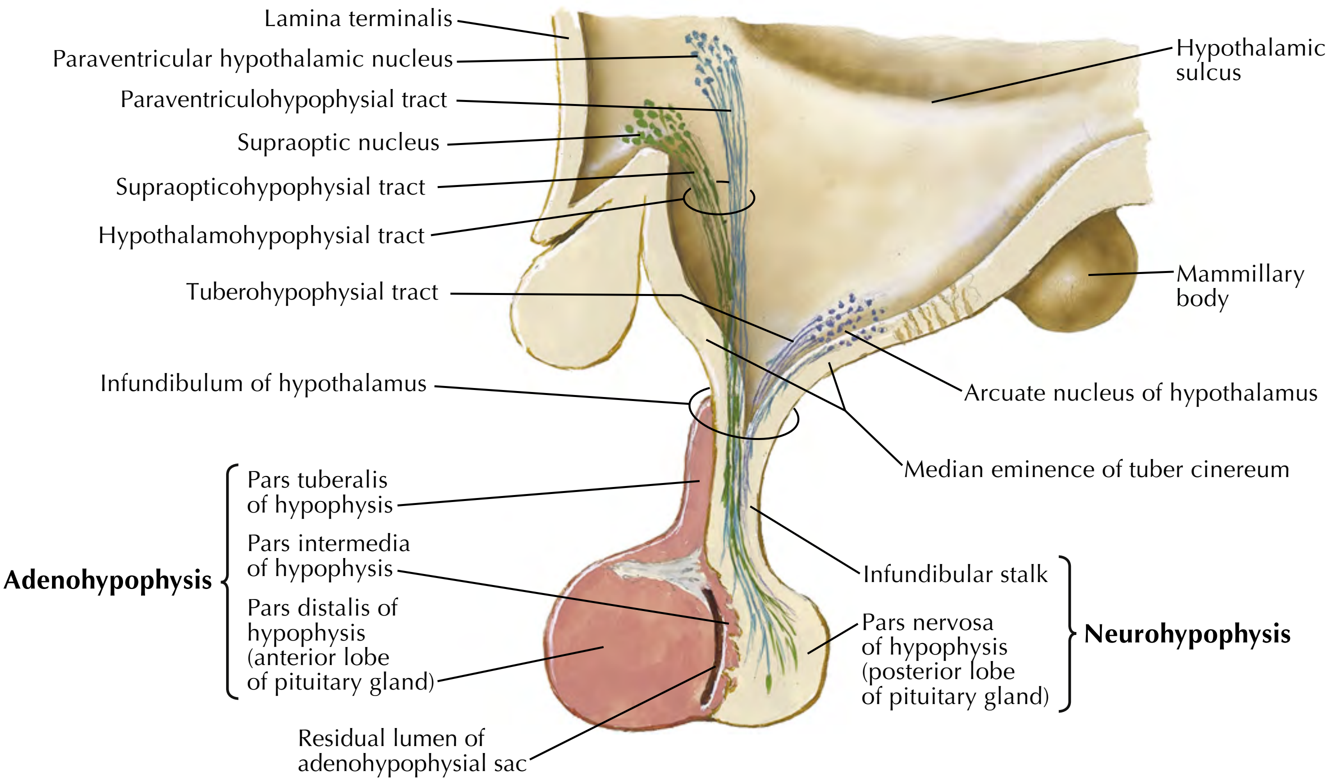

Anterior cerebral v.
Superficial middle cerebral v.
Deep middle cerebral v.
Crus cerebri
Basal v. (of Rosenthal)
Lateral geniculate body
Medial geniculate body
Pulvinar
Splenium of corpus callosum
Great cerebral v. (of Galen)
Uncal v.
Optic chiasm
Inferior cerebral vv.
Inferior anastomotic v. (of Labbé)

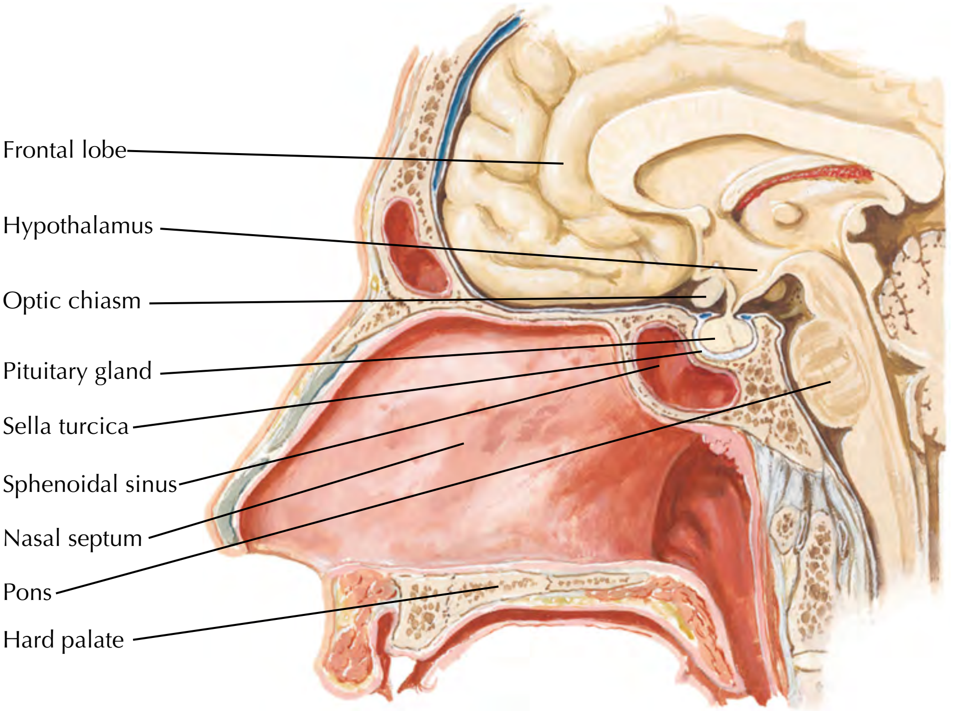
Inferior view

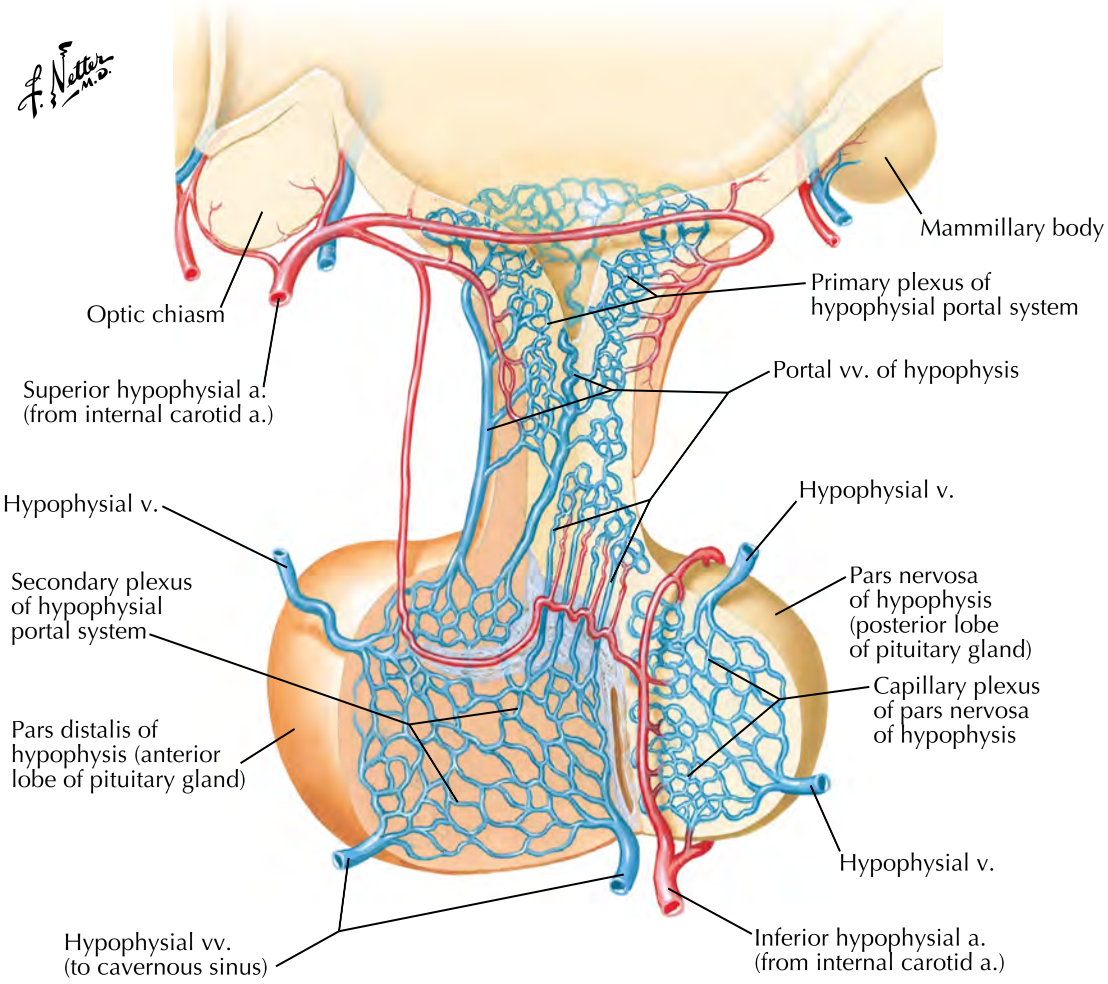
See also **Plate 171**


Posterior vv. of septum pellucidum
Superior choroid v.
Lateral direct v.
Transverse vv. of caudate nucleus
Right and left internal cerebral vv.
Superior thalamostriate v.
Medial v. of lateral ventricle
Lateral ventricle
Lateral v. of lateral ventricle
Anterior v. of caudate nucleus
Splenium of corpus callosum
Great cerebral v. (of Galen)
Anterior v. of septum pellucidum
Dorsal v. of corpus callosum
Genu of corpus callosum
Inferior sagittal sinus
Occipital cerebral v.
Straight sinus
Occipital horn of lateral ventricle
Interventricular foramen (of Monro)
Anterior commissure
Interthalamic adhesion
Anterior cerebral v.
Optic chiasm
Third ventricle
Deep middle cerebral v.
Inferior thalamostriate vv.
Basal v. (of Rosenthal)
Temporal horn of lateral ventricle
Posterior mesencephalic v.
Inferior ventricular v.
Hippocampal v.
Aqueduct of midbrain
Fourth ventricle
Lateral aperture of fourth ventricle (foramen of Luschka)
Median aperture of fourth ventricle (foramen of Magendie)
Cerebellum
Superior vermian v.
🟩 **Veins on lateral wall of ventricle**
🟪 **Veins on medial wall and floor of ventricle**
🟦 **All other veins**

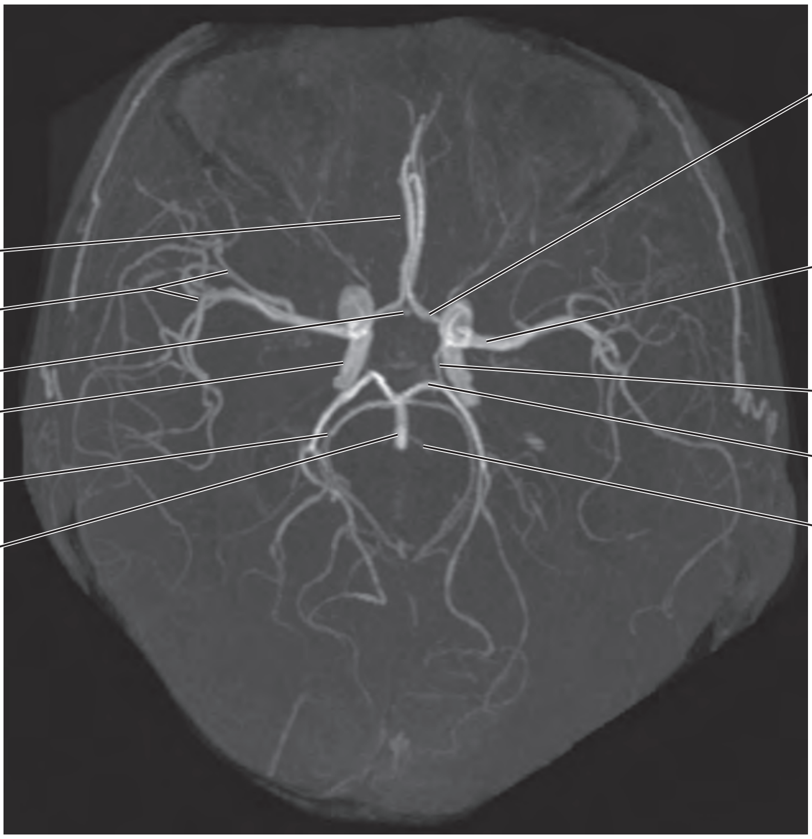

Septum pellucidum
Thalamus
Column of fornix
Interthalamic adhesion
Hypothalamic sulcus
Anterior commissure
Principal nuclei of hypothalamus
Paraventricular hypothalamic nucleus
Posterior hypothalamic nucleus
Dorsomedial hypothalamic nucleus
Supraoptic nucleus
Ventromedial hypothalamic nucleus
Arcuate nucleus
Mammillary nuclei
Optic chiasm
Infundibular stalk
Pituitary gland
Mammillothalamic tract (of Vicq d'Azyr)
Aqueduct of midbrain
Dorsal longitudinal fasciculus and other descending pathways
F. Netter M.D.


Lamina terminalis
Paraventricular hypothalamic nucleus
Paraventriculohypophysial tract
Supraoptic nucleus
Supraopticohypophysial tract
Hypothalamohypophysial tract
Tuberohypophysial tract
Infundibulum of hypothalamus
Adenohypophysis
Pars tuberalis of hypophysis
Pars intermedia of hypophysis
Pars distalis of hypophysis (anterior lobe of pituitary gland)
Residual lumen of adenohypophysial sac
Hypothalamic sulcus
Mammillary body
Arcuate nucleus of hypothalamus
Median eminence of tuber cinereum
Infundibular stalk
Pars nervosa of hypophysis (posterior lobe of pituitary gland)
Neurohypophysis

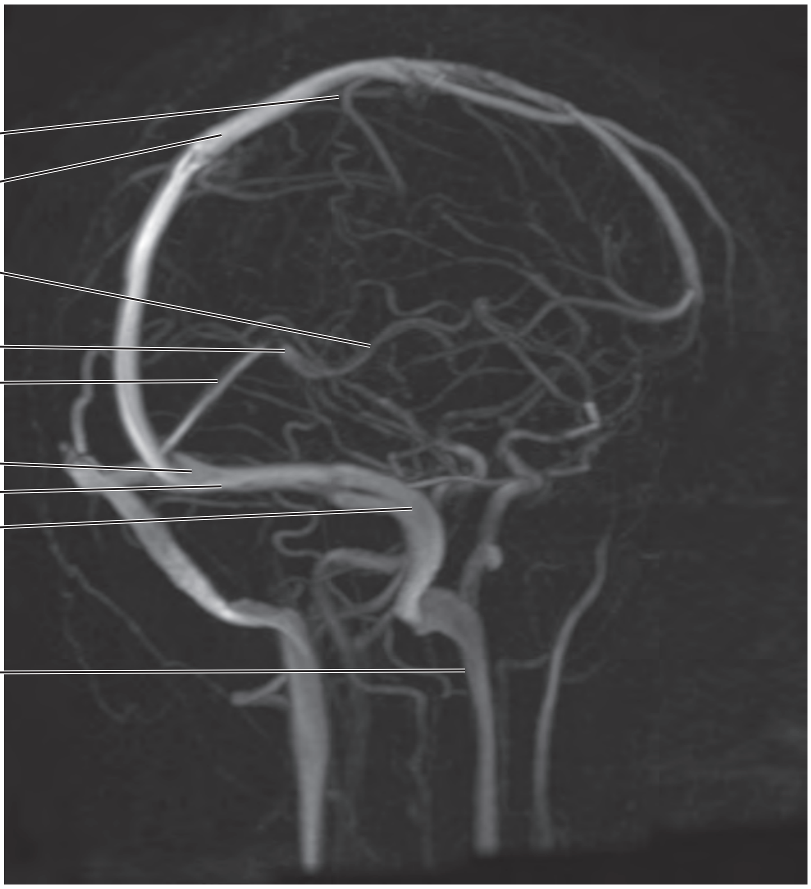

Frontal lobe
Hypothalamus
Optic chiasm
Pituitary gland
Sella turcica
Sphenoidal sinus
Nasal septum
Pons
Hard palate


F. Netter M.D.
Mammillary body
Optic chiasm
Primary plexus of hypophysial portal system
Superior hypophysial a. (from internal carotid a.)
Portal vv. of hypophysis
Hypophysial v.
Hypophysial v.
Secondary plexus of hypophysial portal system
Pars nervosa of hypophysis (posterior lobe of pituitary gland)
Capillary plexus of pars nervosa of hypophysis
Pars distalis of hypophysis (anterior lobe of pituitary gland)
Hypophysial v.
Hypophysial vv. (to cavernous sinus)
Inferior hypophysial a. (from internal carotid a.)

Magnetic resonance angiography (MRA) at level of cerebral arterial circle (3D time-of-flight image without contrast)

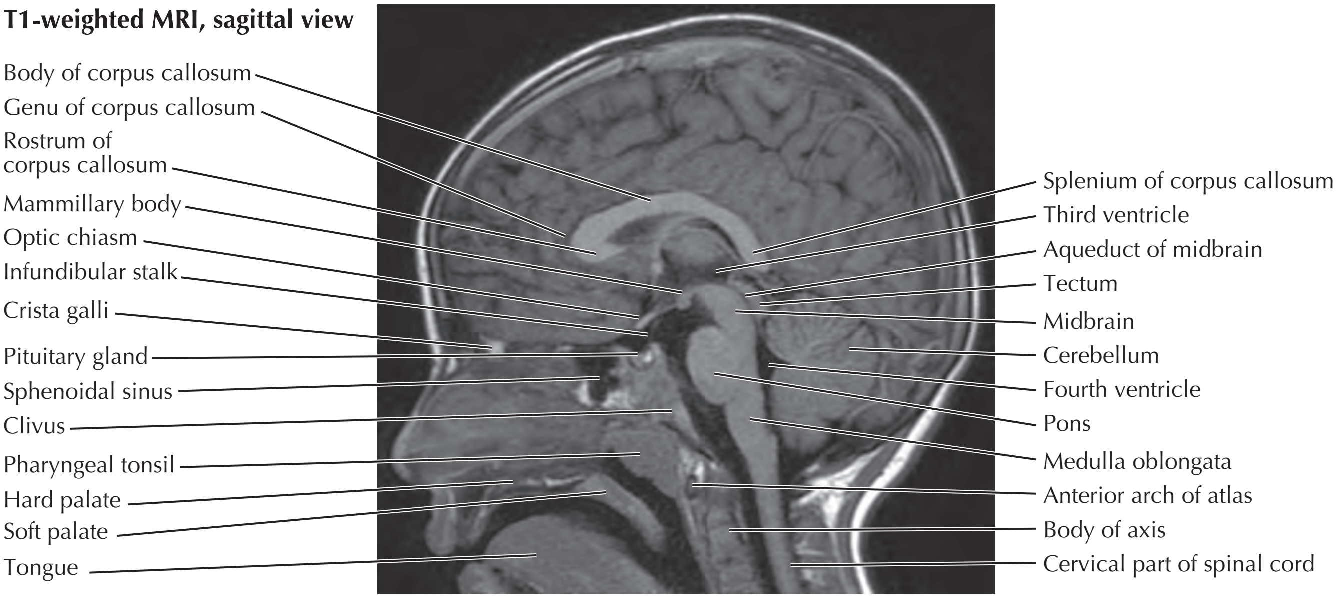

Postcommunicating part of anterior cerebral a. (A2 segment)
Middle cerebral a. (M2 segments)
Anterior communicating a.
Internal carotid a.
Superior cerebellar a.
Basilar a.
Precommunicating part of anterior cerebral a. (A1 segment)
Middle cerebral a. (M1 segment)
Posterior communicating a.
Posterior cerebral a.
Anterior inferior cerebellar a.

Magnetic resonance venography (MRV) (2D time-of-flight image without contrast)

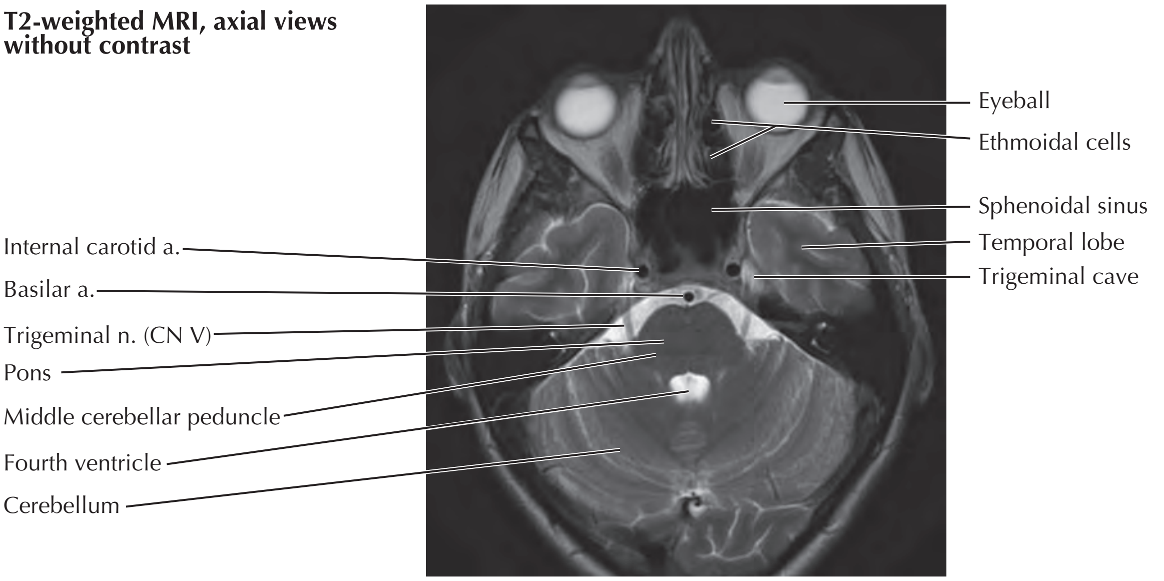

Superior cerebral v.
Superior sagittal sinus
Internal cerebral v.
Great cerebral v. (of Galen)
Straight sinus
Confluence of sinuses
Transverse sinus
Sigmoid sinus
Internal jugular v.

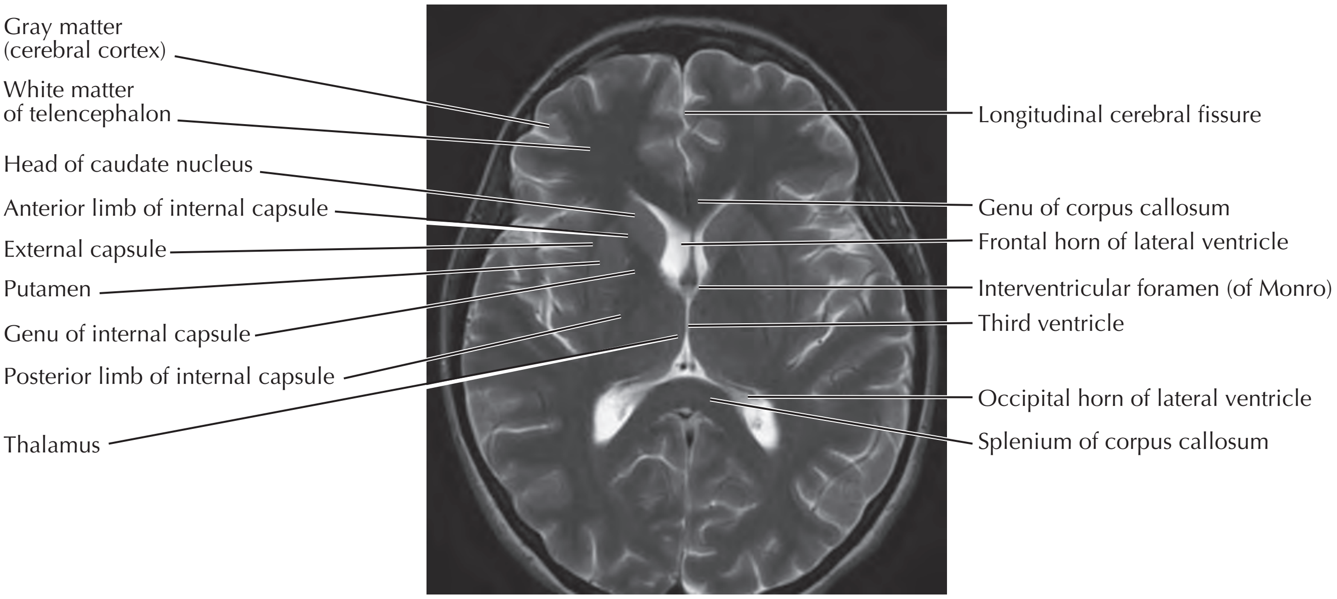
See also **Plate BP 32**

T1-weighted MRI, sagittal view


Body of corpus callosum
Genu of corpus callosum
Rostrum of corpus callosum
Mammillary body
Optic chiasm
Infundibular stalk
Crista galli
Pituitary gland
Sphenoidal sinus
Clivus
Pharyngeal tonsil
Hard palate
Soft palate
Tongue
Splenium of corpus callosum
Third ventricle
Aqueduct of midbrain
Tectum
Midbrain
Cerebellum
Fourth ventricle
Pons
Medulla oblongata
Anterior arch of atlas
Body of axis
Cervical part of spinal cord

T2-weighted MRI, axial views without contrast


Eyeball
Ethmoidal cells
Sphenoidal sinus
Temporal lobe
Trigeminal cave
Internal carotid a.
Basilar a.
Trigeminal n. (CN V)
Pons
Middle cerebellar peduncle
Fourth ventricle
Cerebellum


Gray matter (cerebral cortex)
White matter of telencephalon
Head of caudate nucleus
Anterior limb of internal capsule
External capsule
Putamen
Genu of internal capsule
Posterior limb of internal capsule
Thalamus
Longitudinal cerebral fissure
Genu of corpus callosum
Frontal horn of lateral ventricle
Interventricular foramen (of Monro)
Third ventricle
Occipital horn of lateral ventricle
Splenium of corpus callosum

ANATOMICAL STRUCTURE	CLINICAL COMMENT	PLATE NUMBERS
Nervous System and Sense Organs		
Spinal accessory nerve (CN XI)	Lymph node biopsy in posterior cervical triangle can cause iatrogenic injury of CN XI	56
Cervical plexus	Cervical plexus blocks are performed for neck procedures	56, 57
Trigeminal nerve (CN V)	Branches of CN V are anesthetized for procedures on face or anterior scalp; compression of the nerve may result in painful condition known as trigeminal neuralgia	60, 149
Olfactory nerve (CN I)	One of most commonly injured cranial nerves; can be avulsed at cribriform plate following falls, resulting in anosmia	64, 146
Facial nerve (CN VII)	Idiopathic unilateral facial nerve palsy (Bell's palsy) can result in inability to fully close eye and result in desiccated cornea ipsilaterally	71
Recurrent laryngeal nerve	May be compressed or damaged by procedures in neck (e.g., thyroidectomy), aortic arch aneurysm, or lung cancer, producing hoarseness of voice; identified by (posterior) suspensory ligament of thyroid and/or inferior thyroid artery and/or tracheo-esophageal groove	104, 105
Oculomotor (CN III), trochlear (CN IV), and abducens (CN VI) nerves	Cavernous sinus thrombosis can result in dysfunction of extraocular muscles caused by compression of one, two, or all three nerves; abducens nerve is most commonly affected	131
Superior colliculus and aqueduct of midbrain	Tumor of midbrain can result in compression of aqueduct of midbrain, with resultant hydrocephalus	136
Optic nerve (CN II)	Pituitary gland mass may cause compression at optic chiasm and resulting bitemporal hemianopsia; optic radiations (Meyer's loop) can be affected by temporal lobe tumors; early sign of ophthalmic artery aneurysm is visual loss due to compression of overlying optic nerve.	147, 167
Fovea centralis	Location of highest density of retinal cones, making this part of macula lutea the site of greatest visual acuity and color vision	116
Utricle and saccule	Location of calcium carbonate crystals known as otoconia; accumulation of otoconia in semicircular canals is most common cause of vertigo and is known as benign paroxysmal positional vertigo (BPPV)	124, 125
Lens	Degeneration and opacification, known as cataract, may lead to progressive vision loss	116
Orbital septum	Infections anterior to this structure are known as preseptal/periorbital cellulitis and are milder than infections extending posterior to it, known as orbital cellulitis	110
Anterior segment of eyeball	Ciliary body produces aqueous humor, which flows through iris into anterior chamber and drains through scleral sinus; anterior displacement of lens may obstruct flow of aqueous humor and cause elevated intraocular pressure, a painful, vision-threatening condition known as acute angle closure glaucoma	117, 119
Tympanic membrane	Visualized with otoscope; bulging indicates middle ear infection with effusion; rupture and otorrhea may occur in severe infection; tympanostomy tubes (T-tubes) may be placed in children with recurrent effusive infections	122
External acoustic meatus	May become infected or inflamed in children, a condition known as otitis externa; can be diagnosed with auricle (pinna) pull technique	121
Skeletal System		
Orbit	Most facial trauma involves orbit; traumatic fractures can occur in rim or walls; a "blowout" fracture involves inferior wall and may injure inferior rectus muscle and/or infraorbital nerve; rim fractures affect contours of orbital rim and occur in zygomaticomaxillary fractures	25, 69

ANATOMICAL STRUCTURE	CLINICAL COMMENT	PLATE NUMBERS
Skeletal System—Continued		
Pterion	Intersection of frontal, parietal, temporal, and sphenoid bones; thin, weak region of skull that is susceptible to fracture; frontal branch of middle meningeal artery lies immediately deep to this region and may be injured	27
Asterion	Landmark at posterior end of parietotemporal suture, used in lateral neurosurgical approaches to posterior cranial fossa	27
Temporomandibular joint	Temporomandibular joint disorders are common sources of pain and joint dysfunction; poor replacement results to date; dislocations/subluxations can be reduced via retromolar fossa	42
Cranial sutures	Premature fusion may result in skull deformity known as craniosynostosis; sagittal suture is most often affected	26, 35
Cervical vertebrae	Degenerative changes causing narrowing of intervertebral foramina may result in cervical radiculopathy; C1–C4 and C5–C7 vertebrae are common areas of pathology for children and adults, respectively; neck hyperextension from abrupt deceleration may cause bilateral pedicle fractures in axis (C2 vertebra) known as hangman's fracture; hyperflexion may cause anterior wedge vertebral fracture; axial loads may cause burst fracture; dens axis (odontoid) fractures may occur with either forceful extension or flexion; all fractures are classified as "stable" or "unstable" depending on whether structural integrity of cervical spine has been sufficiently disrupted to permit compression of spinal cord	43–45
Laryngeal cartilages	Thyroid and cricoid cartilages are palpable landmarks of anterior neck used for cricothyrotomy, tracheostomy, and cricoid pressure during airway intubation	103, 106
Hyoid bone	Palpable anterior neck landmark at C3 vertebral level that can be fractured during sporting activities, compromising swallowing and speech; fractures may also indicate strangulation	54
Auditory ossicles	Pathologic conditions involving ossicles (e.g., otosclerosis) can cause conductive hearing loss	121, 122
Muscular System		
Muscles of facial expression	Used to assess function of facial nerve (CN VII) during cranial nerve examination; may become weak or paralyzed with CN VII dysfunction (e.g., Bell's palsy); often targeted with botulinum toxin injections for aesthetics (wrinkles), headache, and teeth grinding	48, 150
Sternocleidomastoid muscle	Important landmark that divides neck into anterior and posterior cervical triangles; palpated to identify "nerve point of neck" for administration of anesthesia to cervical plexus and also used as landmark for insertion of central venous catheters; in children, abnormal shortening or fibrosis of sternocleidomastoid muscle results in head tilt, a condition known as torticollis	56
Sternocleidomastoid and trapezius muscles	Used to assess function of spinal accessory nerve (CN XI) during cranial nerve examination	56, 154
Muscles of mastication	Used to assess function of trigeminal nerve (CN V) during cranial nerve examination; masseter is involved in teeth grinding and associated headaches, which can be treated with botulinum toxin injection	72, 73
Levator veli palatini and musculus uvulae	Used to assess function of vagus nerve (CN X) during cranial nerve examination; contralateral deviation of uvula of soft palate during elevation indicates CN X dysfunction	85
Genioglossus muscle	Used to assess hypoglossal nerve (CN XII) function during cranial nerve examination; tongue deviates to side of lesion when protruded following CN XII injury	88, 155
Styloglossus muscle	Posterosuperior movement covers laryngeal inlet, protecting vocal cords and airway, which is especially crucial if epiglottis has been surgically removed because of malignancy	88, 95, 96

ANATOMICAL STRUCTURE	CLINICAL COMMENT	PLATE NUMBERS
Stapedius muscle	Smallest skeletal muscle in the body, regulates movement of stapes bone to control amplitude of sound	123
Levator palpebrae superioris and superior tarsal muscle	Responsible for elevating eyelid; ptosis indicates pathologic change in oculomotor nerve (CN III) or sympathetic fibers (if only superior tarsal muscle is affected)	110, 112
Extraocular muscles	Used to assess function of oculomotor (CN III), trochlear (CN IV), and abducens (CN VI) nerves during cranial nerve examination; abnormalities in tone result in disconjugate eye movements, a condition known as strabismus	112, 114
Dilator pupillae	Important in assessment of sympathetic function in head; lack of dilation indicates interruption in sympathetic outflow (e.g., Horner's syndrome)	117, 148
Sphincter pupillae	Involved in pupillary light reflex and accommodation reflex	117, 148
Pterygomandibular raphe	Valuable intraoral landmark for inferior alveolar nerve blocks to anesthetize mandibular teeth	96, 97–99
Modiolus of angulus oris	A fibrous intersection of facial muscles, approximately 1 cm lateral to corner of mouth; valuable landmark when considering reconstruction of injured facial muscles associated with oral region	48
Retromolar fossa	Important clinical landmark for reducing dislocated temporomandibular joints; buccal and lingual nerves pass by the retromolar fossa and may be harmed in dental molar implant surgery	39
Cardiovascular System		
Right internal and external jugular veins	Examined to assess right atrial pressure, estimated as height of jugular pulsation above sternal angle (in centimeters) plus 5; right internal jugular vein is preferred because it is in line with superior vena cava	50
Internal jugular vein	Thrombosis may occur secondary to local extension of inflammation from severe pharyngitis, a condition known as Lemierre's syndrome	50
Internal jugular and subclavian veins	Used to obtain venous access via insertion of central venous catheter	50, 100
Inferior thyroid artery	At risk during thyroidectomy; must be preserved to maintain blood supply to parathyroid glands; identified by its redundant loop shape and is landmark to identify recurrent laryngeal nerve	57, 104
Common carotid artery	Palpate in neck to assess carotid pulse; bifurcation typically at C4 vertebral level	58, 165
Internal carotid artery	Common site for atherosclerosis, which may be treated with stent or endarterectomy for stroke prevention; carotid sinus is sensitive to changes in circulating blood volume and may be massaged to induce vagal reaction; internal carotid artery has no branches in neck; classified into seven parts: C1, cervical; C2, petrous; C3, lacerum; C4, cavernous; C5, clinoid; C6, ophthalmic; and C7, communicating	163, 164
Anterior ethmoidal, sphenopalatine, and facial arteries	Anastomosis site of branches of these vessels in nasal vestibule, known as Kiesselbach's plexus or Little's area, is common site of anterior nosebleeds (epistaxis); sphenopalatine artery injury causes posterior nosebleeds	65
Pterygoid venous plexus	Common route for spread of infection due to connections between face, orbit, and venous sinuses; valveless veins allow retrograde flow	100, 115
Ophthalmic artery	Primary source of blood to retina; blindness may occur if artery is occluded	115, 119
Arteries of scalp	Scalp lacerations bleed profusely owing to rich blood supply	24, 127
Superior cerebral veins	May be torn from their junction with superior sagittal sinus, producing subdural hematoma	129, 130, 136
Middle meningeal artery	Trauma to pterion can tear middle meningeal artery (frontal branch), often causing epidural hematoma	128

ANATOMICAL STRUCTURE	CLINICAL COMMENT	PLATE NUMBERS
Cardiovascular System—Continued		
Dural venous sinuses	Infections in head may spread to sinuses, causing dural venous sinus thrombosis; cavernous sinus is most common site	130, 131
Cavernous sinus	Fistula (anastomosis) between internal carotid artery and cavernous sinus may form, especially following trauma	131,167
Carotid sinus	Compressed during carotid sinus massage, which may result in bradycardia and/or hypertension; carotid sinus hypersensitivity, most common among older adults, may cause syncope	157
Cerebral arterial circle of Willis	Common site of aneurysms and important site of collateral cerebral circulation; aneurysmal rupture produces subarachnoid hemorrhage	166
Emissary veins	Valveless veins, which can convey infection extracranially to intracranially and allow alternative route for drainage when dural venous sinuses are obstructed	129
Lymph Vessels and Lymphoid Organs		
Thoracic duct	Thoracic duct may be injured during surgeries to neck and thorax due to multiple and frequent variants; injury in lower neck region is often at junction of left internal jugular and subclavian veins; increased risk during esophageal surgery and left central venous line placement	101, 260
Superior and inferior deep lateral cervical nodes	Palpated during neck examination to assess size and shape; if coalescent, malignancy must be excluded	101, 102
Palatine and pharyngeal tonsils	Palatine tonsils are commonly involved with viral and bacterial infection; exudative lesions combined with fever, lymphadenopathy, and lack of cough suggestive of streptococcal infection (strep throat); enlarged pharyngeal tonsils (adenoids) cause snoring and can cover auditory (eustachian) tube opening, increasing risk of middle ear infections	90
Respiratory System		
Epiglottis	Crucial landmark during endotracheal intubation; bacterial or viral infection (e.g., with *Haemophilus influenzae*) may cause epiglottitis, which presents with respiratory distress, sore throat, and hoarse voice	93–95
Paranasal sinuses (maxillary, ethmoid, frontal, and sphenoid)	Cavities in skull prone to mucosal inflammation due to bacterial or viral infection	67, 69
Nasal septum	Congenital or acquired deviation may lead to nasal obstruction, treated with septoplasty; perforations may occur with cocaine use or in granulomatosis with polyangiitis	37, 69
Digestive System		
Parotid gland	Swelling of gland due to infection (parotitis), such as from viruses or bacteria, may cause pain and compress branches of facial nerve, producing facial muscle weakness; external carotid, superficial temporal, and maxillary arteries also pass through the gland	70, 71
Endocrine System		
Thyroid gland	Enlargement is known as goiter; may be partially or completely removed in malignancy or hyperthyroidism; during examination should move relatively equally bilaterally with hyoid bone and laryngeal cartilages; malignancy may anchor portion of gland and cause asymmetrical movement	103

*Selections were based largely on clinical data and commonly discussed clinical correlations in macroscopic ("gross") anatomy courses.

Cranial nerves are traditionally described as tree-like structures that emerge from the brain and branch peripherally. This matches the direction that action potentials travel in efferent fibers in nerves. It must be remembered that action potentials travel in the opposite direction in afferent fibers within these nerves.

NERVE	ORIGIN	COURSE	BRANCHES	MOTOR	SENSORY
Olfactory nerve (CN I)	Olfactory bulb	Neurons of olfactory mucosa send approximately 20 axon bundles through cribriform plate to synapse on olfactory bulb neurons			SVA (smell): olfactory epithelium
Optic nerve (CN II)	Optic chiasm	Axons of retinal ganglion neurons exit orbit through optic canal to enter cranial cavity			SSA (vision): optic part of retina
Oculomotor nerve (CN III)	Interpeduncular fossa of midbrain	Exits midbrain into posterior cranial fossa and then middle cranial fossa; traverses cavernous sinus to enter orbit via superior orbital fissure	Superior and inferior branches	GSE: medial, superior, and inferior rectus muscles, inferior oblique muscles, and levator palpebrae superioris GVE: ciliary ganglion	
Trochlear nerve (CN IV)	Posterior surface of midbrain	Exits dorsal midbrain, coursing lateral to cerebral peduncle to anterior surface of brain stem; follows medial edge of tentorium cerebelli to enter middle cranial fossa; traverses cavernous sinus to enter orbit via superior orbital fissure		GSE: superior oblique muscle	
Trigeminal nerve (CN V)	Motor and sensory roots (arising from pons)	Exits anterolateral pons into posterior cranial fossa; large sensory and small motor roots enter middle cranial fossa; sensory root forms trigeminal ganglion, which gives rise to ophthalmic, maxillary, and mandibular nerves; motor root passes deep to ganglion and contributes only to mandibular nerve	Ophthalmic, maxillary, and mandibular nerves	SVE: see branches	GSA: see branches
Ophthalmic nerve (CN V_1)	Trigeminal nerve	Exits anterior border of trigeminal ganglion and traverses cavernous sinus to leave cranium through superior orbital fissure into orbit	Lacrimal, frontal, and nasociliary nerves, meningeal branch		GSA: forehead, upper eyelid, conjunctiva
Maxillary nerve (CN V_2)	Trigeminal nerve	Exits trigeminal ganglion, passes through foramen rotundum into pterygopalatine fossa, and enters orbit via inferior orbital fissure	Nasopalatine, pharyngeal, palatine, zygomatic, posterior superior alveolar, and infraorbital nerves, superior posterior nasal and meningeal branches		GSA: midface, nasal cavity, paranasal sinuses, palate, maxillary teeth
Mandibular nerve (CN V_3)	Trigeminal nerve	Exits trigeminal ganglion inferiorly, leaves cranium through foramen ovale and enters infratemporal fossa	Deep temporal, buccal, auriculotemporal, lingual, and inferior alveolar nerves, meningeal branch	SVE: muscles of mastication, mylohyoid and digastric (anterior belly) muscles, tensor tympani, tensor veli palatini	GSA: mandibular teeth, anterior tongue, floor of oral cavity, temporomandibular joint

Continued

NERVE	ORIGIN	COURSE	BRANCHES	MOTOR	SENSORY
Abducens nerve (CN VI)	Medullopontine sulcus (medial to CN VII)	Exits between pons and medulla near midline, pierces dura on clivus and grooves on petrous part of temporal bone to access middle cranial fossa; traverses cavernous sinus to enter orbit through superior orbital fissure		GSE: lateral rectus muscle	
Facial nerve (CN VII)	Motor root and intermediate nerve (sensory root)	Exits laterally between pons and medulla oblongata as a larger motor root and smaller intermediate nerve (carrying SVA, GVE, and GSA fibers); both roots traverse internal acoustic meatus to enter facial canal, in which a sharp turn (genu) occurs just before geniculate (facial) ganglion; facial nerve gives off several branches within facial canal, before it exits through stylomastoid foramen and forms terminal branches within parotid gland	Greater petrosal and posterior auricular nerves, chorda tympani, and temporal, zygomatic, buccal, marginal mandibular, and cervical branches	SVE: muscles of facial expression (including epicranial muscles and platysma), digastric (posterior belly), stylohyoid, and stapedius muscles GVE: pterygopalatine and submandibular ganglia	SVA (taste): anterior tongue GSA: part of external ear
Vestibulocochlear nerve (CN VIII)	Medullopontine sulcus (lateral to CN VII)	Exits brain stem between pons and medulla oblongata, near inferior cerebellar peduncle, and divides into two branches as it traverses posterior cranial fossa	Vestibular and cochlear nerves		SSA: internal ear (see branches)
Cochlear nerve	Vestibulocochlear nerve	Contains processes of cochlear ganglion cells; passes through internal acoustic meatus into internal ear			SSA (hearing): spiral organ of cochlear duct
Vestibular nerve	Vestibulocochlear nerve	Contains processes of vestibular ganglion cells; passes through internal acoustic meatus into internal ear	Superior and inferior branches		SSA (equilibrium and motion): maculae and cristae ampullares of vestibular labyrinth
Glossopharyngeal nerve (CN IX)	Retro-olivary groove of medulla oblongata	Emerges from upper medulla between olive and inferior cerebral peduncle and exits cranium by traversing jugular foramen with vagus and accessory nerves; superior and inferior ganglia for afferent components of CN IX are located just inferior to jugular foramen; passes inferiorly, innervating and following stylopharyngeus muscle, ultimately sending a branch into posterior oral cavity that passes deep to hyoglossus muscle and a branch that enters pharynx by passing between superior and middle pharyngeal constrictors	Tympanic nerve	SVE: stylopharyngeus muscle GVE: otic ganglion	SVA (taste): posterior tongue GVA: carotid body and sinus GSA: posterior tongue, oropharynx, middle ear

NERVE	ORIGIN	COURSE	BRANCHES	MOTOR	SENSORY
Vagus nerve (CN X)	Retro-olivary groove of medulla oblongata (between CN IX and cranial roots of CN XI)	Exits from retro-olivary groove of medulla oblongata to traverse jugular foramen with accessory and glossopharyngeal nerves; initially runs between internal carotid artery and internal jugular vein; courses of right and left vagus nerves differ, with right vagus nerve coursing inferiorly between subclavian artery and vein, at which point right recurrent laryngeal nerve ascends and vagus nerve descends along trachea and root of right lung, forming pulmonary and esophageal plexuses; left vagus nerve descends between left subclavian and common carotid arteries posteriorly to left brachiocephalic vein, and anteriorly to aortic arch, at which point left recurrent laryngeal nerve ascends posteriorly to aorta and rest of vagus nerve descends posteriorly to root of lung, forming pulmonary and esophageal plexuses; vagus nerve fibers continue into abdomen via esophageal plexuses and vagal trunks	Pharyngeal branch, superior and recurrent laryngeal nerves	GVE: thoracic and abdominal visceral ganglia SVE: see branches	GVA: aortic arch and bodies SVA (taste): epiglottis, oropharynx GSA: external ear (also see branches)
Pharyngeal branch of vagus nerve	Vagus nerve	Passes between carotid arteries superficial to middle pharyngeal constrictor		SVE: pharyngeal constrictors; palatoglossus, palatopharyngeus, and salpingopharyngeus muscles; and levator veli palatini	
Superior laryngeal nerve	Vagus nerve	Exits inferior ganglion, passing inferiorly and medially deep to internal carotid artery, dividing into external (motor) branch and internal (sensory) branch that pierces thyrohyoid membrane	Internal and external branches	SVE: cricothyroid muscle	GSA: superior larynx
Recurrent laryngeal nerve	Vagus nerve	On right side, arises anterior to subclavian artery and spirals to run superiorly and posteriorly to common carotid and inferior thyroid arteries, lateral to trachea; on left side, arises inferior to aortic arch, passing posterior to arch and lateral to ligamentum arteriosum to ascend superiorly lateral to trachea; both right and left nerves enter larynx at junction of esophagus and inferior pharyngeal constrictor		SVE: intrinsic muscles of larynx (except cricothyroid), striated muscle of esophagus	GSA: inferior larynx

Continued

NERVE	ORIGIN	COURSE	BRANCHES	MOTOR	SENSORY
Accessory nerve (CN XI)	Cranial and spinal roots	Spinal roots from C1–C5 segments of spinal cord ascend and enter cranium through foramen magnum, where they course with cranial root arising from retro-olivary groove of medulla oblongata; spinal accessory nerve exits from cranium via jugular foramen; it passes inferiorly and posteriorly into upper third of sternocleidomastoid muscle and then inferiorly, crossing occipital triangle to enter trapezius muscle;. vagal communicating branch joins vagus nerve at jugular foramen to innervate larynx, palate, and pharyngeal muscles	Spinal accessory nerve, vagal communicating branch	GSE: trapezius and sternocleidomastoid muscles	
Hypoglossal nerve (CN XII)	Hypoglossal rootlets and hypoglossal communicating branch of C1 spinal nerve	Rootlets from anterolateral sulcus of medulla oblongata exit cranium through hypoglossal canal, then pass inferiorly and anteriorly between vagus and spinal accessory nerves to inferior border of posterior belly of digastric muscle, eventually entering oral cavity by passing between mylohyoid and hyoglossus muscles	Lingual branches and branches conveying fibers from C1 spinal nerve (thyrohoid and geniohyoid branches and superior root of ansa cervicalis)	GSE: intrinsic muscles of tongue and genioglossus, hyoglossus, and styloglossus muscles C1: thyrohyoid, geniohyoid, and omohyoid (superior belly) muscles	

The roots of the cervical plexus are the anterior rami of C1–C4 spinal nerves.

NERVE	ORIGIN	COURSE	BRANCHES	MOTOR	CUTANEOUS SENSORY
Hypoglossal communicating branch	Anterior ramus of C1 spinal nerve	Emerges and briefly adheres to hypoglossal nerve; superior root of ansa cervicalis exits just posterior to greater horn of hyoid bone and descends along carotid sheath, where it joins inferior root at C4–C5 level	Superior root of ansa cervicalis, thyrohyoid and geniohyoid branches of hypoglossal nerve	Omohyoid (superior belly), thyrohyoid, and geniohyoid muscles	
Inferior root of ansa cervicalis	Anterior rami of C2–C3 spinal nerves	Descends along anterolateral carotid sheath, joining superior root at C4–C5 level	Infrahyoid branches	Omohyoid (inferior belly), sternohyoid, and sternothyroid muscles	
Muscular branches of cervical plexus	Anterior rami of C1–C4 spinal nerves	Three loops form along C1–C4 vertebrae that course laterally between levator scapulae and scalenus medius muscle, deep to sternocleidomastoid muscle		Rectus anterior and lateralis capitis, longus capitis and longus colli; scalenus anterior, medius and posterior muscles; levator scapulae	
Phrenic nerve	Anterior rami of C3–C5 spinal nerves	Descends on scalenus anterior muscle deep to inferior belly of omohyoid muscle and transverses cervical and suprascapular vessels; enters thorax between subclavian vein and artery, passing anterior to root of lung and along lateral border of pericardium to pierce diaphragm		Diaphragm	
Lesser occipital nerve	Anterior ramus of C2 spinal nerve	Formed in posterior cervical triangle deep to sternocleidomastoid muscle, ascending along its posterior border; perforates deep fascia at mastoid process, ascending posterior to ear			Temporal, auricular, and mastoid regions
Great auricular nerve	Anterior rami of C2–C3 spinal nerves	Formed in posterior cervical triangle deep to sternocleidomastoid muscle, ascending obliquely between that muscle and platysma	Anterior and posterior branches		Parotid, auricular, and mastoid regions
Transverse cervical nerve	Anterior rami of C2–C3 spinal nerves	Formed in posterior cervical triangle deep to sternocleidomastoid muscle, runs superficial to that muscle, passing deep to external jugular vein	Superior and inferior branches		Anterior and lateral regions of neck
Supraclavicular nerve	Anterior rami of C3–C4 spinal nerves	Formed in posterior cervical triangle deep to mid-third of sternocleidomastoid muscle, passes lateral to external jugular vein, and descends just inferior to clavicle	Medial, intermediate, and lateral supraclavicular nerves		Clavicular and infraclavicular regions

MUSCLE	MUSCLE GROUP	ORIGIN ATTACHMENT	INSERTION ATTACHMENT	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Auricularis anterior m.	Facial expression (external ear)	Temporal fascia, epicranial aponeurosis	Anterior part of medial surface of helix of ear	Temporal branches of facial nerve	Posterior auricular and superficial temporal arteries	Elevates and draws auricle forward
Auricularis posterior m.	Facial expression (external ear)	Mastoid process	Inferior part of medial surface of auricle	Posterior auricular nerve (branch of facial nerve)	Posterior auricular and superficial temporal arteries	Retracts and elevates auricle
Auricularis superior m.	Facial expression (external ear)	Temporal fascia, epicranial aponeurosis	Superior part of medial surface of auricle	Temporal branches of facial nerve	Posterior auricular and superficial temporal arteries	Retracts and elevates auricle
Bucinator	Facial expression	Posterior portions of alveolar processes of maxilla and mandible, anterior border of pterygomandibular raphe	Modiolus of angle of mouth	Buccal branches of facial nerve	Facial and maxillary arteries	Compresses cheeks
Ciliary m.	Intrinsic eye (smooth muscle)	Scleral spur	Choroid	Short ciliary nerves (parasympathetic fibers from ciliary ganglion)	Ophthalmic artery	Constricts ciliary body and lens rounds up (accommodation)
Corrugator supercilii	Facial expression	Medial part of supra-orbital margin	Skin of medial half of eyebrow	Temporal branches of facial nerve	Superficial temporal artery	Draws eyebrows inferiorly and medially, produces vertical wrinkles of skin between eyebrows
Cricothyroid m.	Laryngeal	Arch of cricoid cartilage	Inferior border of lamina and inferior horn of thyroid cartilage	External branch of superior laryngeal nerve	Superior and inferior thyroid arteries	Lengthens and tenses vocal ligaments
Depressor anguli oris	Facial expression	Oblique line of mandible	Modiolus of angle of mouth	Marginal mandibular and buccal branches of facial nerve	Inferior labial artery	Depresses angle of mouth
Depressor labii inferioris	Facial expression	External surface of mandible between symphysis and mental foramen	Skin of lower lip	Marginal mandibular branches of facial nerve	Inferior labial artery	Depresses lower lip and draws it laterally
Depressor septi nasi	Facial expression	Incisive fossa of maxilla	Nasal septum and posterior part of ala of nose	Zygomatic and buccal branches of facial nerve	Superior labial artery	Narrows nostril, draws septum inferiorly
Digastric m.	Suprahyoid	*Anterior belly:* digastric fossa of mandible *Posterior belly:* mastoid notch of temporal bone	Intermediate tendon attached to body of hyoid	*Anterior belly:* inferior alveolar nerve (branch of mandibular nerve) *Posterior belly:* digastric branch of facial nerve	*Anterior belly:* submental artery *Posterior belly:* posterior auricular and occipital arteries	Elevates hyoid bone and base of tongue, steadies hyoid bone, opens mouth by depressing mandible
Dilator pupillae	Intrinsic eye (smooth muscle)	Iridal part of retina	Pupillary margin of iris	Long ciliary nerves (sympathetic fibers from superior cervical ganglion)	Ophthalmic artery	Dilates pupil
Frontalis m.	Facial expression (epicranial)	Epicranial aponeurosis (at level of coronal suture)	Skin of frontal region, epicranial aponeurosis	Temporal branches of facial nerve	Superficial temporal artery	Horizontally wrinkles skin of forehead, elevates eyebrows
Genioglossus m.	Extrinsic tongue	Superior mental spine of mandible	Dorsum of tongue, hyoid bone	Hypoglossal nerve (CN XII)	Sublingual and submental arteries	Depresses and protrudes tongue
Geniohyoid m.	Suprahyoid	Inferior mental spine of mandible	Anterior surface of body of hyoid bone	Anterior ramus of C1 spinal nerve (via hypoglossal nerve)	Sublingual artery	Elevates hyoid bone and depresses mandible
Hyoglossus m.	Extrinsic tongue	Body and greater horn of hyoid bone	Margin and inferior surface of tongue	Hypoglossal nerve (CN XII)	Sublingual and submental arteries	Depresses and retracts tongue
Inferior longitudinal lingual m.	Intrinsic tongue	Inferior surface of tongue	Apex of tongue	Hypoglossal nerve (CN XII)	Lingual and facial arteries	Shortens tongue, turns tip and sides inferiorly

MUSCLE	MUSCLE GROUP	ORIGIN ATTACHMENT	INSERTION ATTACHMENT	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Inferior oblique m.	Extraocular	Anterior floor of orbit (lateral to nasolacrimal canal)	Sclera lateral to corneoscleral junction	Oculomotor nerve (CN III)	Ophthalmic artery	Abducts, elevates, and laterally rotates eyeball
Inferior pharyngeal constrictor	Circular pharyngeal	Oblique line of thyroid cartilage, cricoid cartilage	Pharyngeal raphe	Vagus nerve (via pharyngeal plexus)	Ascending pharyngeal and superior thyroid arteries	Constricts wall of pharynx during swallowing
Inferior rectus m.	Extraocular	Common tendinous ring	Sclera inferior to corneoscleral junction	Oculomotor nerve (CN III)	Ophthalmic artery	Depresses, adducts, and laterally rotates eyeball
Lateral cricoarytenoid m.	Laryngeal	Arch of cricoid cartilage	Muscular process of arytenoid cartilage	Recurrent laryngeal nerve	Superior and inferior thyroid arteries	Adducts vocal folds
Lateral pterygoid m.	Mastication	*Superior head:* infratemporal surface of greater wing of sphenoid bone *Inferior head:* lateral pterygoid plate	Pterygoid fovea of mandible, capsule and articular disc of temporomandibular joint	Mandibular nerve (CN V_3)	Maxillary artery	*Bilaterally:* protrudes mandible *Unilaterally and alternately:* produces side-to-side grinding
Lateral rectus m.	Extraocular	Common tendinous ring	Sclera lateral to corneoscleral junction	Abducens nerve (CN VI)	Ophthalmic artery	Abducts eyeball
Levator anguli oris	Facial expression	Canine fossa of maxilla	Modiolus of angle of mouth	Zygomatic and buccal branches of facial nerve	Superior labial artery	Elevates angle of mouth
Levator nasolabialis (levator labii superioris alaeque nasi)	Facial expression	Superior part of frontal process of maxilla	Major alar cartilage, skin of nose, lateral part of upper lip	Zygomatic and buccal branches of facial nerve	Superior labial and angular arteries	Elevates upper lip and dilates nostril
Levator labii superioris	Facial expression	Maxilla superior to infraorbital foramen	Skin of upper lip	Zygomatic and buccal branches of facial nerve	Superior labial and angular arteries	Elevates upper lip, dilates nares
Levator palpebrae superioris	Extraocular	Lesser wing of sphenoid bone (anterior to optic canal)	Superior tarsus	Oculomotor nerve (CN III)	Ophthalmic artery	Elevates upper eyelid
Levator veli palatini	Palatal	Petrous part of temporal bone, auditory tube	Palatine aponeurosis	Vagus nerve (via pharyngeal plexus)	Ascending and descending palatine arteries	Elevates soft palate during swallowing
Longus capitis m.	Anterior vertebral	Anterior tubercles of transverse processes of C3–C6 vertebrae	Inferior surface of basilar part of occipital bone	Anterior rami of C1–C3 spinal nerves	Ascending cervical, ascending pharyngeal and vertebral arteries	Flexes head
Longus colli m.	Anterior vertebral	*Vertical portion:* C5–T3 vertebrae *Inferior oblique portion:* T1–T3 vertebrae *Superior oblique portion:* anterior tubercles of transverse processes of C3–C5 vertebrae	*Vertical portion:* C2–C4 vertebrae *Inferior oblique portion:* anterior tubercles of transverse processes of C3–C6 vertebrae *Superior oblique portion:* anterior tubercle of atlas	Anterior rami of C2–C8 spinal nerves	Ascending pharyngeal, ascending cervical and vertebral arteries	*Bilaterally:* flex and assist in rotating cervical vertebrae and head *Unilaterally:* laterally flexes vertebral column
Masseter	Mastication	Zygomatic arch	Ramus of mandible, coronoid process	Mandibular nerve (CN V_3)	Transverse facial, masseteric, and facial arteries	Elevates and protrudes mandible; deep fibers retract it

Continued

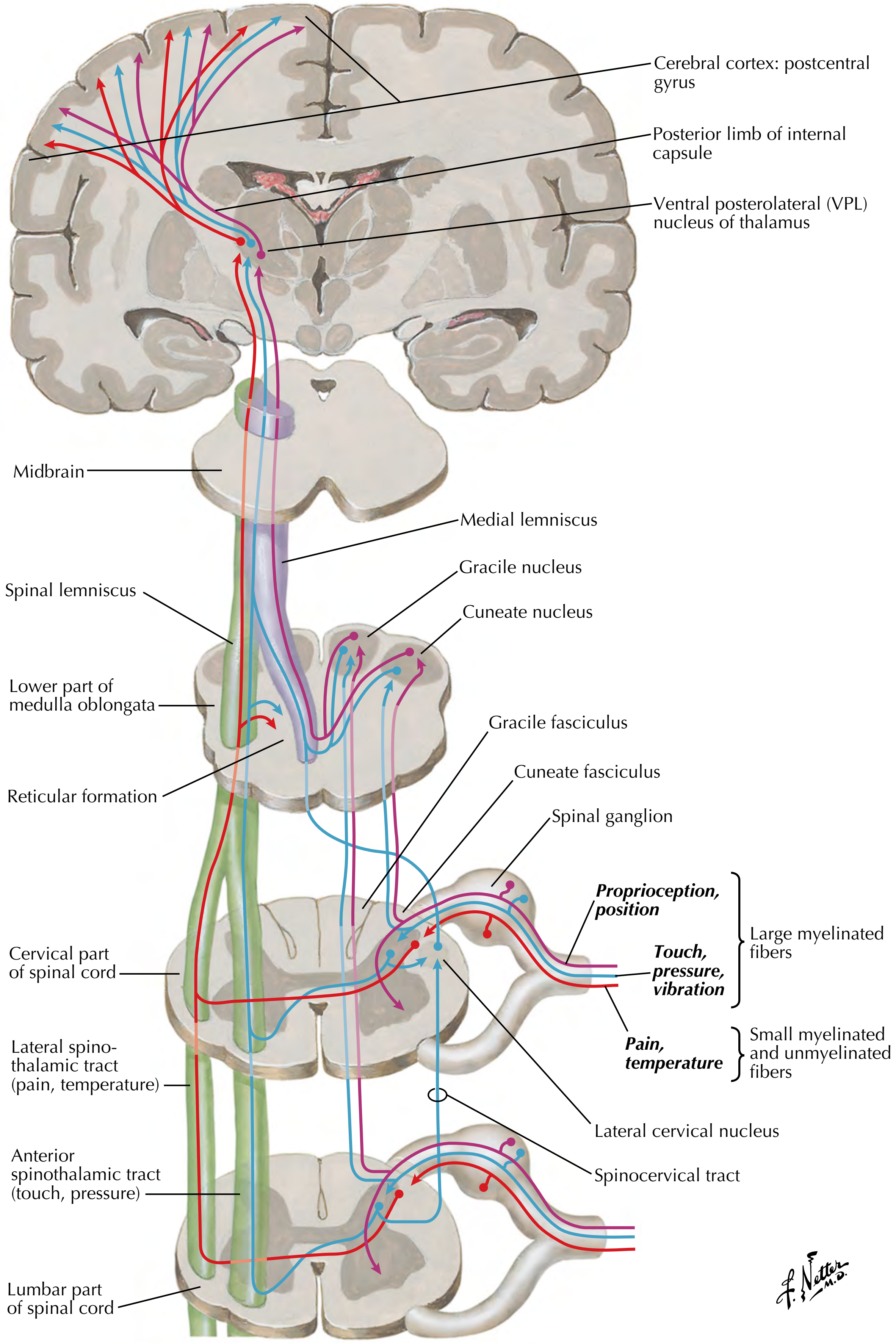
MUSCLE	MUSCLE GROUP	ORIGIN ATTACHMENT	INSERTION ATTACHMENT	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Medial pterygoid m.	Mastication	Medial surface of lateral pterygoid plate, pyramidal process of palatine bone, maxillary tuberosity	Medial surface of ramus and angle of mandible (inferior to mandibular foramen)	Mandibular nerve (V_3)	Facial and maxillary arteries	Bilaterally: protrudes and elevates mandible Unilaterally and alternately: produces side-to-side movements
Medial rectus m.	Extraocular	Common tendinous ring	Sclera medial to corneoscleral junction	Oculomotor nerve (CN III)	Ophthalmic artery	Adducts eyeball
Mentalis m.	Facial expression	Incisive fossa of mandible	Skin of chin	Marginal mandibular branch of facial nerve	Inferior labial artery	Elevates and protrudes lower lip
Middle pharyngeal constrictor	Circular pharyngeal	Stylohyoid ligament, horns of hyoid bone	Pharyngeal raphe	Vagus nerve (via pharyngeal plexus)	Ascending pharyngeal and ascending palatine arteries, tonsillar branches of facial artery, dorsal lingual branches of lingual artery	Constricts wall of pharynx during swallowing
Musculus uvulae	Palatal	Posterior nasal spine (of palatine bone), palatine aponeurosis	Mucosa of uvula of palate	Vagus nerve (via pharyngeal plexus)	Ascending and descending palatine arteries	Shortens, elevates, and retracts uvula of the palate
Mylohyoid m.	Suprahyoid	Mylohyoid line of mandible	Median raphe of mylohyoid, body of hyoid bone	Inferior alveolar nerve (branch of mandibular nerve)	Sublingual and submental arteries	Elevates hyoid bone, base of tongue, floor of mouth; depresses mandible
Nasalis m.	Facial expression	Canine eminence (superior and lateral to incisive fossa of maxilla)	Aponeurosis on nasal cartilages	Buccal branches of facial nerve	Superior labial artery, septal and lateral nasal branches of facial artery	Draws ala of nose toward nasal septum, compresses nostrils; alar part opens nostrils
Oblique arytenoid m.	Laryngeal	Arytenoid cartilage	Opposite arytenoid cartilage	Recurrent laryngeal nerve	Superior and inferior thyroid arteries	Closes intercartilaginous portion of rima glottidis
Occipitalis m.	Facial expression (epicranial)	Lateral two-thirds of superior nuchal line, mastoid process	Skin of occipital region, epicranial aponeurosis	Posterior auricular nerve (branch of facial nerve)	Posterior auricular and occipital arteries	Moves scalp backward
Omohyoid m.	Infrahyoid	*Inferior belly:* superior border of scapula, superior transverse scapular ligament *Superior belly:* body of hyoid bone	Intermediate tendon of omohyoid	*Inferior belly:* ansa cervicalis (C2–C3) *Superior belly:* ansa cervicalis (C1)	Lingual and superior thyroid arteries	Steadies and depresses hyoid bone
Orbicularis oculi m.	Facial expression	Medial orbital margin, medial palpebral ligament, lacrimal bone	Skin around orbit, lateral palpebral ligament, upper and lower eyelids	Temporal and zygomatic branches of facial nerve	Facial and superficial temporal arteries	Closes eyelids
Orbicularis oris m.	Facial expression	Maxilla and mandible, perioral skin and muscles	Modiolus of angle of mouth	Buccal and marginal mandibular branches of facial nerve	Inferior and superior labial arteries	Compression, contraction, and protrusion of lips
Palatoglossus m.	Palatal	Palatine aponeurosis	Margin of tongue	Vagus nerve (via pharyngeal plexus)	Ascending pharyngeal artery, palatine branches of facial and maxillary arteries	Elevates posterior tongue, depresses palate
Palatopharyngeus m.	Palatal	Hard palate, palatine aponeurosis	Lateral pharyngeal wall	Vagus nerve (via pharyngeal plexus)	Ascending and descending palatine arteries	Tenses soft palate; pulls walls of pharynx superiorly, anteriorly, and medially during swallowing

MUSCLE	MUSCLE GROUP	ORIGIN ATTACHMENT	INSERTION ATTACHMENT	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Platysma	Facial expression (neck)	Skin of infraclavicular region	Mandible, muscles of lower lip	Cervical branch of facial nerve	Submental and suprascapular arteries	Tenses skin of neck
Posterior cricoarytenoid m.	Laryngeal	Posterior surface of lamina of cricoid cartilage	Muscular process of arytenoid cartilage	Recurrent laryngeal nerve	Superior and inferior thyroid arteries	Abducts vocal folds
Procerus m.	Facial expression	Fascia covering inferior part of nasal bone and superior part of lateral nasal cartilage	Skin medial and superior to eyebrow	Temporal and zygomatic branches of facial nerve	Angular artery, lateral nasal branches of facial artery	Draws down medial angle of eyebrows, produces transverse wrinkles over bridge of nose
Rectus anterior capitis m.	Anterior vertebral	Lateral mass of atlas	Basilar part of occipital bone	Anterior rami of C1–C2 spinal nerves	Vertebral and ascending pharyngeal arteries	Flexes head
Rectus lateralis capitis m.	Anterior vertebral	Superior surface of transverse process of atlas	Inferior surface of jugular process of occipital bone	Anterior rami of C1–C2 spinal nerves	Vertebral, occipital, and ascending pharyngeal arteries	Flexes head laterally to same side
Risorius m.	Facial expression	Fascia over masseter	Modiolus of angle of mouth	Buccal branches of facial nerve	Superior labial artery	Retracts angle of mouth
Salpingopharyngeus m.	Longitudinal pharyngeal	Auditory tube	Lateral pharyngeal wall	Vagus nerve (via pharyngeal plexus)	Ascending pharyngeal artery	Elevates pharynx and larynx during swallowing and speaking
Scalenus anterior m.	Lateral vertebral	Anterior tubercles of transverse processes of C3–C6 vertebrae	Scalene tubercle on 1st rib	Anterior rami of C5–C8 spinal nerves	Ascending cervical artery	Elevates 1st rib, bends neck
Scalenus medius m.	Lateral vertebral	Posterior tubercles of transverse processes of C2–C7 vertebrae	Superior surface of 1st rib (behind subclavian groove)	Anterior rami of C3–C7 spinal nerves	Ascending cervical artery	Elevates 1st rib, bends neck
Scalenus posterior m.	Lateral vertebral	Posterior tubercles of transverse processes of C4–C6 vertebrae	External surface of 2nd rib	Anterior rami of C5–C8 spinal nerves	Ascending cervical artery, superficial branch of transverse cervical artery	Elevates 2nd rib, bends neck
Sphincter pupillae	Intrinsic eye (smooth muscle)	Circular smooth muscle of iris that passes around pupil	Blends with dilator pupillae fibers	Short ciliary nerves (parasympathetic fibers from ciliary ganglion)	Ophthalmic artery	Constricts pupil
Stapedius m.	Middle ear	Pyramidal eminence of temporal bone (in tympanic cavity)	Stapes	Nerve to stapedius muscle (branch of facial nerve)	Posterior auricular, anterior tympanic, and middle meningeal arteries	Pulls stapes posteriorly to lessen oscillation of tympanic membrane
Sternocleidomastoid m.	Neck	*Sternal head:* anterior surface of manubrium stemi *Clavicular head:* medial third of superior surface of clavicle	Lateral surface of mastoid process; lateral half of superior nuchal line of occipital bone	Spinal accessory nerve (CN XI)	Superior thyroid, occipital, suprascapular, and posterior auricular arteries	*Bilaterally:* flexes head, elevates thorax *Unilaterally:* turns face toward opposite side
Sternohyoid m.	Infrahyoid	Posterior surface of manubrium sterni, posterior sternoclavicular ligament, sternal end of clavicle	Medial part of inferior border of body of hyoid bone	Ansa cervicalis (C1–C3)	Superior thyroid and lingual arteries	Depresses larynx and hyoid bone, steadies hyoid bone
Sternothyroid m.	Infrahyoid	Posterior surface of manubrium sterni, posterior border of 1st costal cartilage	Oblique line of thyroid cartilage	Ansa cervicalis (C1–C3)	Cricothyroid branch of superior thyroid artery	Depresses larynx and thyroid cartilage
Styloglossus m.	Extrinsic tongue	Styloid process of temporal bone, stylohyoid ligament	Margin and inferior surface of tongue	Hypoglossal nerve (CN XII)	Sublingual artery	Retracts tongue and draws it up for swallowing
Stylohyoid m.	Suprahyoid	Posterior border of styloid process of temporal bone	Body of hyoid bone (at junction with greater horn)	Stylohyoid branch of facial nerve	Facial and occipital arteries	Elevates and retracts hyoid bone

Continued

MUSCLE	MUSCLE GROUP	ORIGIN ATTACHMENT	INSERTION ATTACHMENT	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Stylopharyngeus m.	Longitudinal pharyngeal	Medial surface of styloid process of temporal bone	Pharyngeal wall, posterior border of thyroid cartilage	Glossopharyngeal nerve (CN IX)	Ascending pharyngeal and ascending palatine arteries, tonsillar branches of facial artery, dorsal lingual branches of lingual artery	Elevates pharynx and larynx during swallowing and speaking
Superior longitudinal lingual m.	Intrinsic tongue	Submucosa of posterior part of dorsum of tongue	Apex of tongue; (unites with muscle of opposite side)	Hypoglossal nerve (CN XII)	Deep lingual branch of lingual artery, facial artery	Shortens tongue, turns tip and sides superiorly
Superior oblique m.	Extraocular	Body of sphenoid bone (above optic canal)	Sclera superior to corneoscleral junction (after passing through trochlea)	Trochlear nerve (CN IV)	Ophthalmic artery	Abducts, depresses, and medially rotates eyeball
Superior pharyngeal constrictor	Circular pharyngeal	Pterygoid hamulus, pterygomandibular raphe, mylohyoid line of mandible	Pharyngeal raphe	Vagus nerve (via pharyngeal plexus)	Ascending pharyngeal and ascending palatine arteries, tonsillar branches of facial artery, dorsal branches of lingual artery	Constricts wall of pharynx during swallowing
Superior rectus m.	Extraocular	Common tendinous ring	Sclera superior to corneoscleral junction	Oculomotor nerve (CN III)	Ophthalmic artery	Elevates, adducts, and medially rotates eyeball
Temporalis m.	Mastication	Temporal fossa, deep layer of temporal fascia	Coronoid process, ramus of mandible	Deep temporal nerves (branches of mandibular nerve)	Superficial temporal and maxillary arteries	Elevates mandible; posterior fibers retract mandible
Tensor tympani	Middle ear	Cartilage of auditory tube	Handle of malleus	Mandibular nerve (CN V_3)	Superior tympanic artery	Tenses tympanic membrane by drawing it medially
Tensor veli palatini	Palatal	Scaphoid fossa of medial pterygoid plate, spine of sphenoid bone, auditory tube	Palatine aponeurosis	Mandibular nerve (CN V_3)	Ascending and descending palatine arteries	Tenses soft palate, opens auditory tube during swallowing and yawning
Thyroarytenoid m.	Laryngeal	Internal surface of thyroid cartilage	Muscular process of arytenoid cartilage	Recurrent laryngeal nerve	Superior and inferior thyroid arteries	Shortens and relaxes vocal cords, sphincter of vestibule
Thyrohyoid m.	Infrahyoid	Oblique line of thyroid cartilage	Inferior border of body and greater horn of hyoid bone	Anterior ramus of C1 spinal nerve (via hypoglossal nerve)	Superior thyroid artery	Depresses larynx and hyoid bone, elevates larynx when hyoid bone is fixed
Transverse arytenoid m.	Laryngeal	Arytenoid cartilage	Opposite arytenoid cartilage	Recurrent laryngeal nerve	Superior and inferior thyroid arteries	Closes intercartilaginous portion of rima glottidis
Transversus linguae m.	Intrinsic tongue	Septum of tongue	Dorsum and margin of tongue	Hypoglossal nerve (CN XII)	Deep lingual branch of lingual artery, facial artery	Narrows and elongates tongue
Verticalis linguae m.	Intrinsic tongue	Mucosa of anterior part of dorsum of tongue	Inferior surface of tongue	Hypoglossal nerve (CN XII)	Deep lingual branch of lingual artery, facial artery	Flattens and broadens tongue
Vocalis m.	Laryngeal	Vocal process of arytenoid cartilage	Vocal ligament	Recurrent laryngeal nerve	Superior and inferior thyroid arteries	Tenses anterior part of vocal ligament, relaxes posterior part of vocal ligament
Zygomaticus major m.	Facial expression	Zygomatic arch	Modiolus of angle of mouth	Zygomatic and buccal branches of facial nerve	Superior labial artery	Draws angle of mouth posteriorly and superiorly
Zygomaticus minor m.	Facial expression	Zygomatic arch	Modiolus of angle of mouth, upper lip	Zygomatic and buccal branches of facial nerve	Superior labial artery	Elevates upper lip

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.


Cerebral cortex: postcentral gyrus
Posterior limb of internal capsule
Ventral posterolateral (VPL) nucleus of thalamus
Midbrain
Medial lemniscus
Gracile nucleus
Cuneate nucleus
Spinal lemniscus
Lower part of medulla oblongata
Gracile fasciculus
Cuneate fasciculus
Reticular formation
Spinal ganglion
Proprioception, position
Touch, pressure, vibration
Large myelinated fibers
Cervical part of spinal cord
Pain, temperature
Small myelinated and unmyelinated fibers
Lateral spino-thalamic tract (pain, temperature)
Lateral cervical nucleus
Anterior spinothalamic tract (touch, pressure)
Spinocervical tract
Lumbar part of spinal cord
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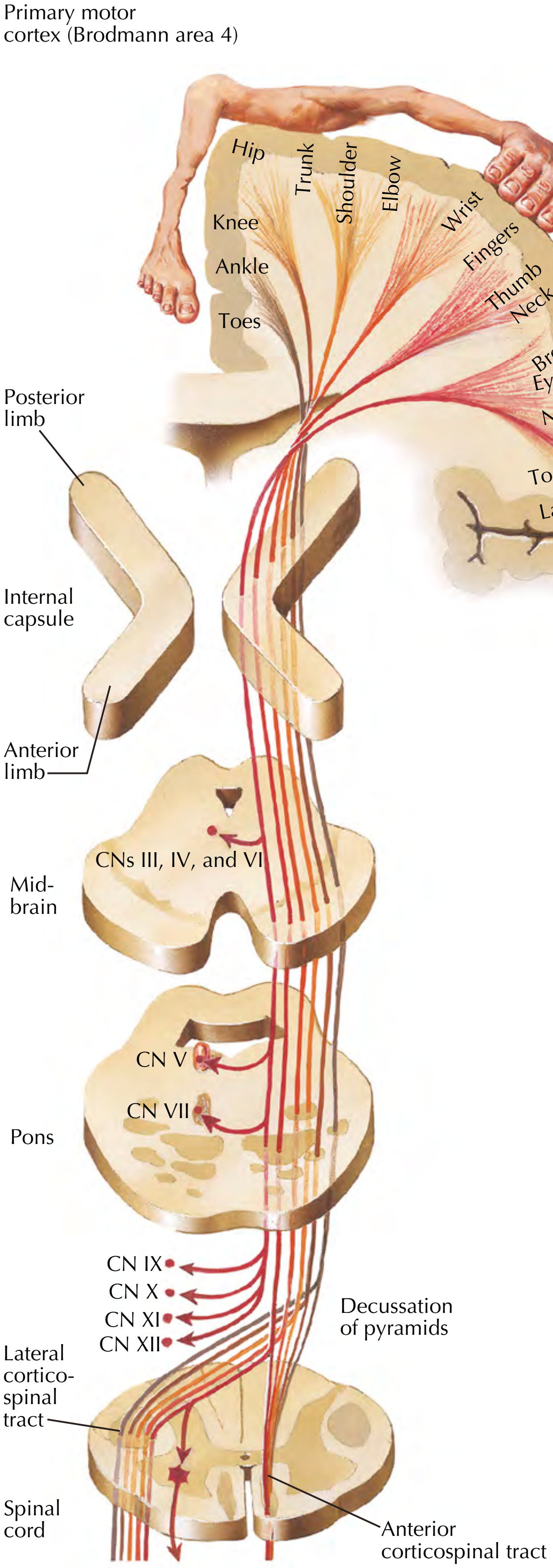
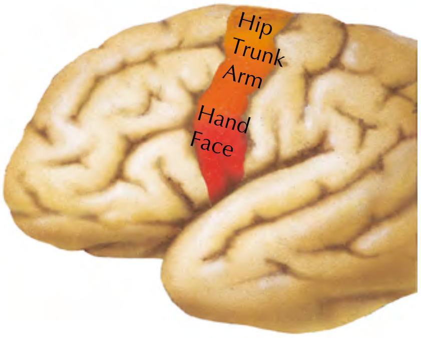
Pyramidal System

See also **Plate BP 40**

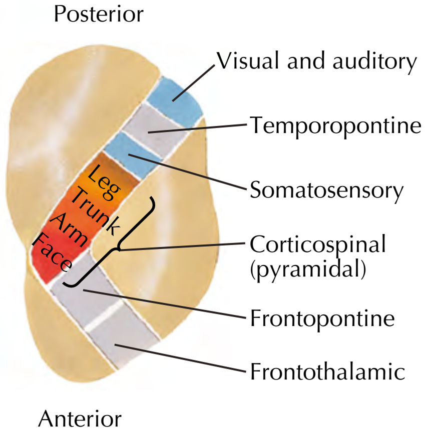


Primary motor cortex (Brodmann area 4)
Hip
Trunk
Shoulder
Elbow
Wrist
Fingers
Thumb
Neck
Brow
Eyelid
Nares
Lips
Tongue
Larynx
Knee
Ankle
Toes
Posterior limb
Internal capsule
Anterior limb
CNs III, IV, and VI
Mid-brain
CN V
CN VII
Pons
CN IX
CN X
CN XI
CN XII
Decussation of pyramids
Lateral cortico-spinal tract
Spinal cord
Anterior corticospinal tract



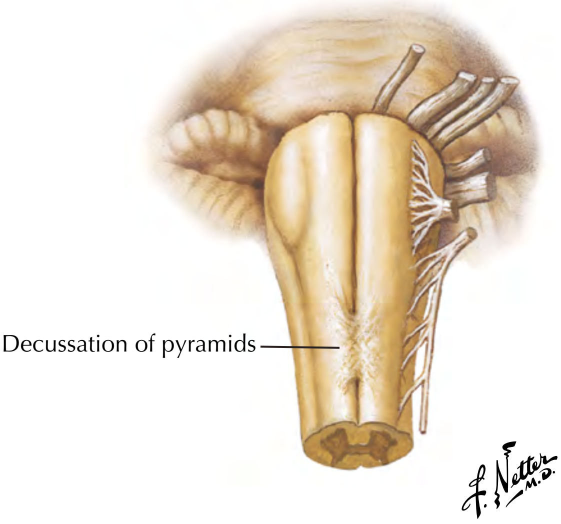
Hip
Trunk
Arm
Hand
Face

Lateral aspect of cerebal cortex to show topographic projection of motor centers on precentral gyrus



Posterior
Visual and auditory
Temporopontine
Somatosensory
Leg
Trunk
Arm
Face
Corticospinal (pyramidal)
Frontopontine
Frontothalamic
Anterior

Horizontal section through internal capsule to show location of principal pathways

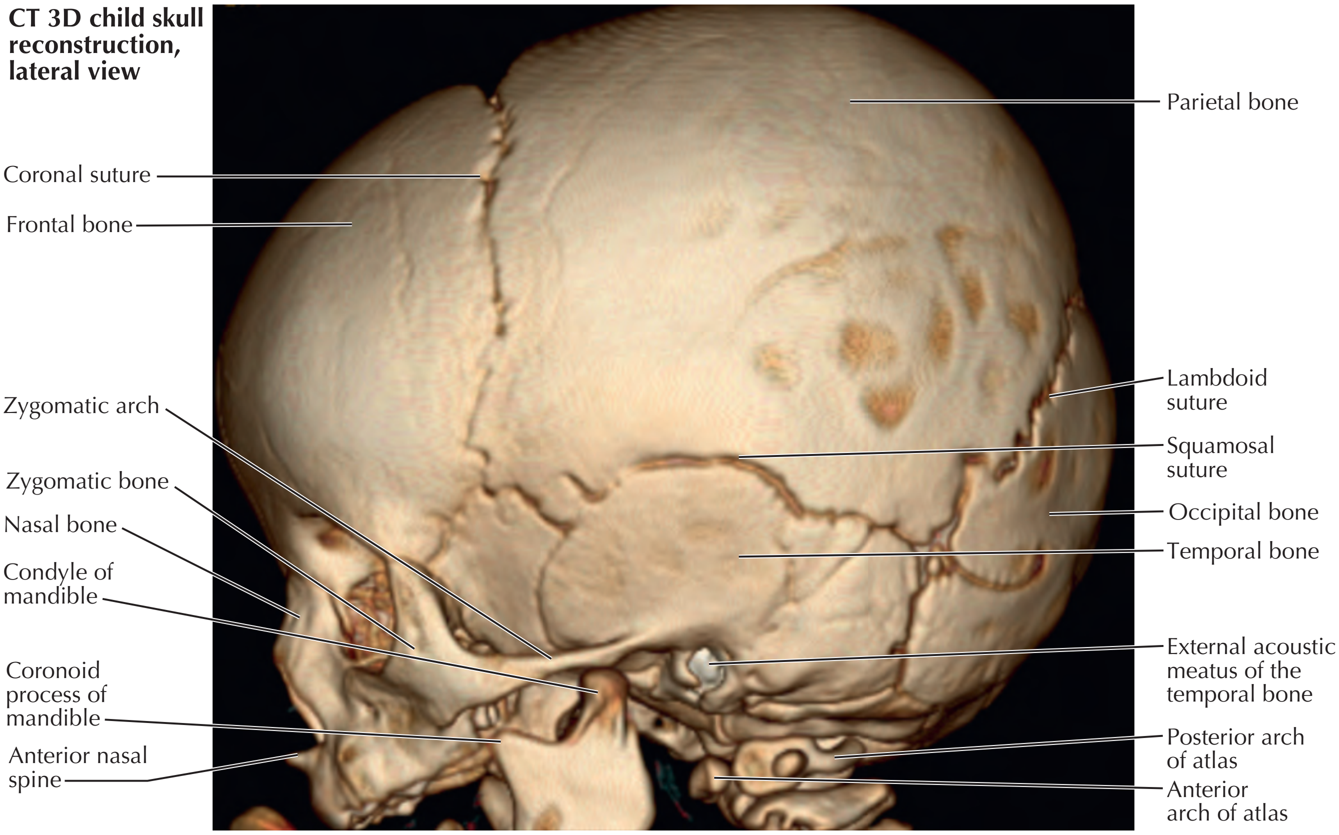


Decussation of pyramids

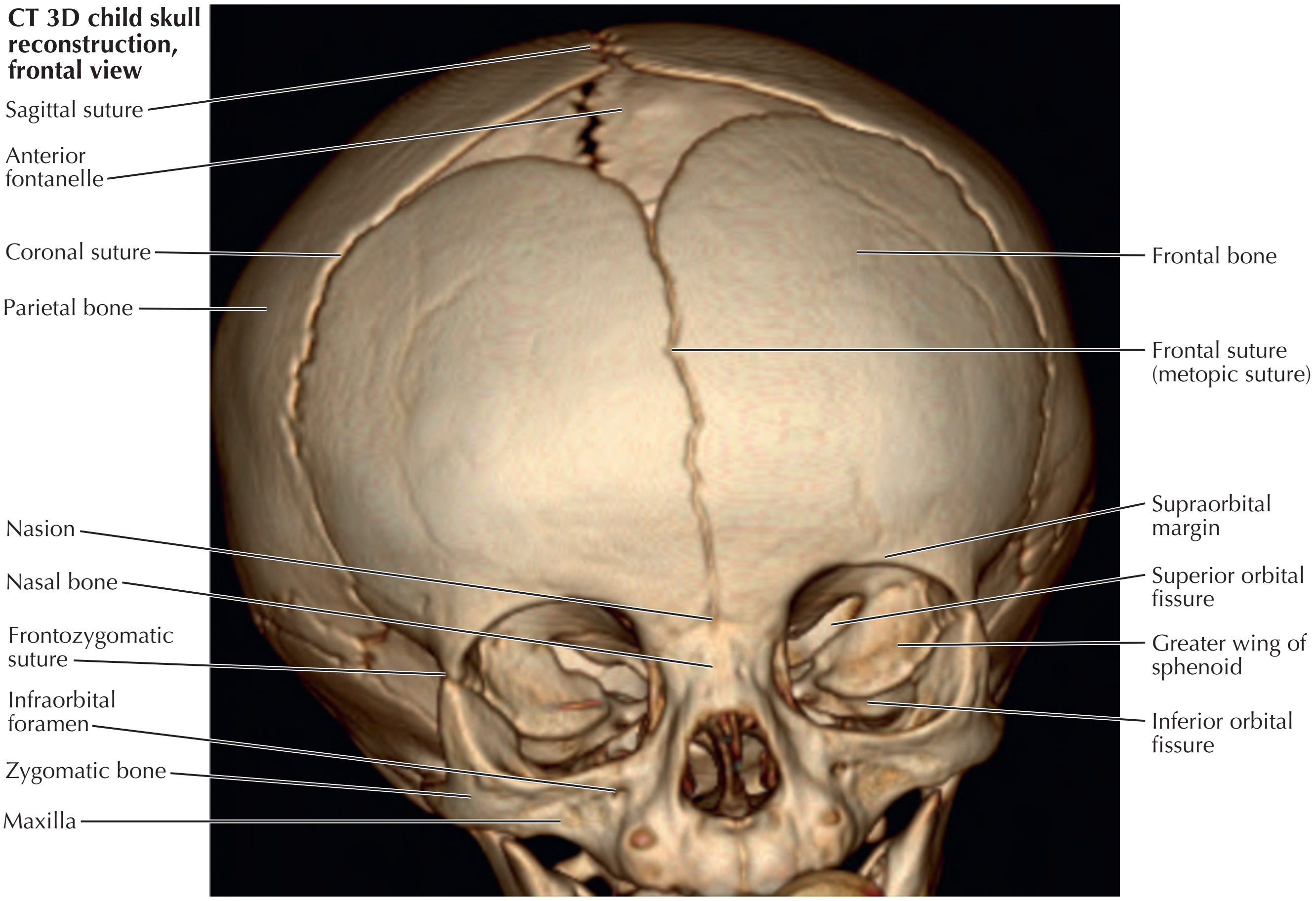
Anterior aspect of brain stem showing decussation of pyramids

See also **Plates 35, 56**

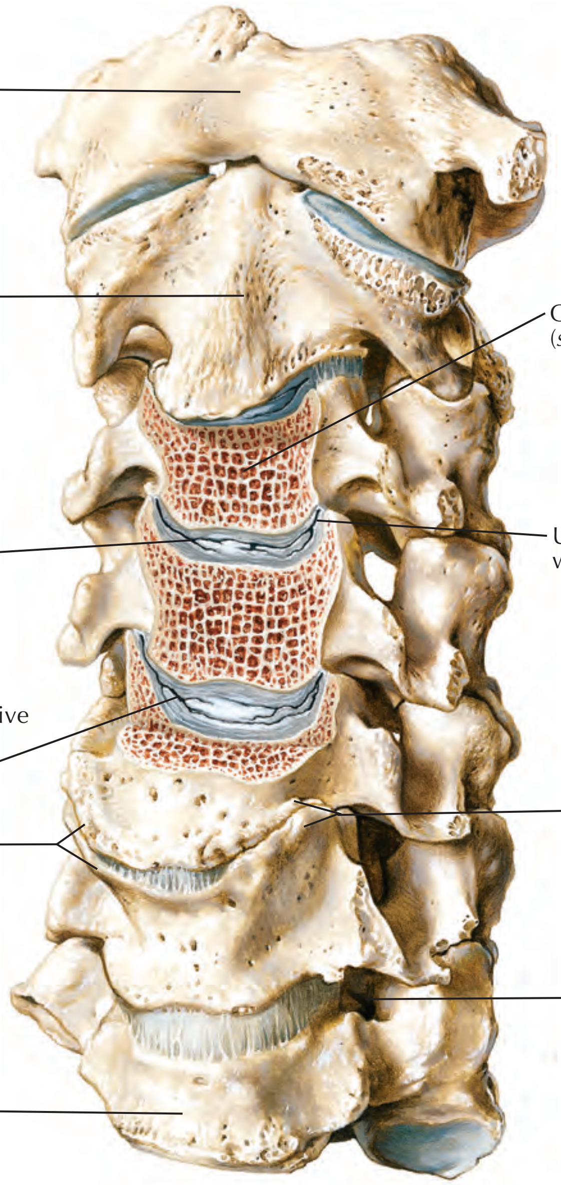
CT 3D child skull reconstruction, lateral view


Coronal suture
Frontal bone
Zygomatic arch
Zygomatic bone
Nasal bone
Condyle of mandible
Coronoid process of mandible
Anterior nasal spine
Parietal bone
Lambdoid suture
Squamosal suture
Occipital bone
Temporal bone
External acoustic meatus of the temporal bone
Posterior arch of atlas
Anterior arch of atlas

CT 3D child skull reconstruction, frontal view


Sagittal suture
Anterior fontanelle
Coronal suture
Parietal bone
Nasion
Nasal bone
Frontozygomatic suture
Infraorbital foramen
Zygomatic bone
Maxilla
Frontal bone
Frontal suture (metopic suture)
Supraorbital margin
Superior orbital fissure
Greater wing of sphenoid
Inferior orbital fissure

Degenerative Changes in Cervical Vertebrae



Degenerative changes in the cervical spine (ankylosing spondylitis)

Atlas (C1 vertebra)
Axis (C2 vertebra)
C3 vertebral body (*sectioned in coronal plane*)
Complete transverse cleft in intervertebral disc
Uncovertebral joint with cleft formation
Spread of cleft formation into central portion of intervertebral disc with age, leading to progressive degenerative changes in the intervertebral disc
Deformed vertebral bodies and lipping of vertebral margins
Spondylophytes (osteophytes) on uncinate processes
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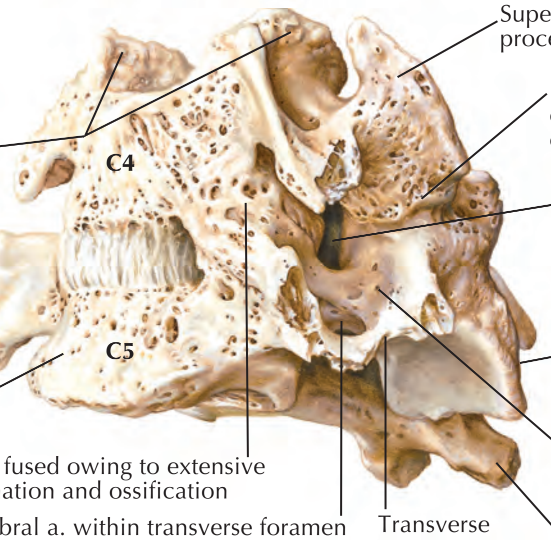
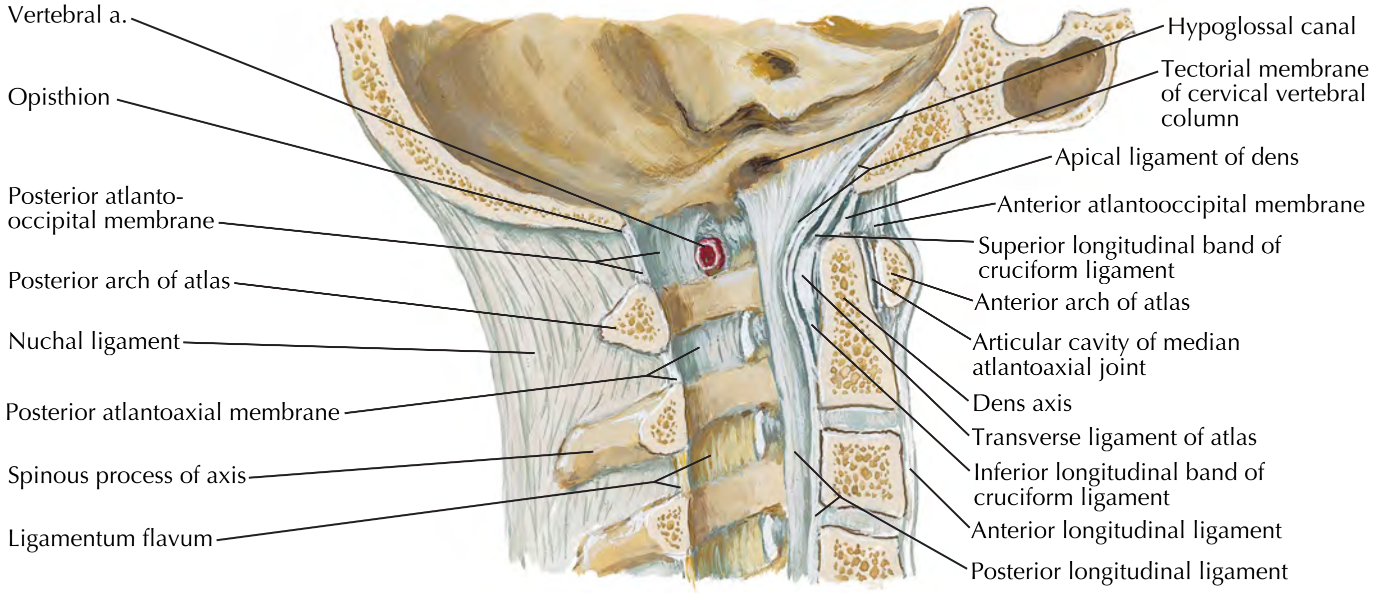
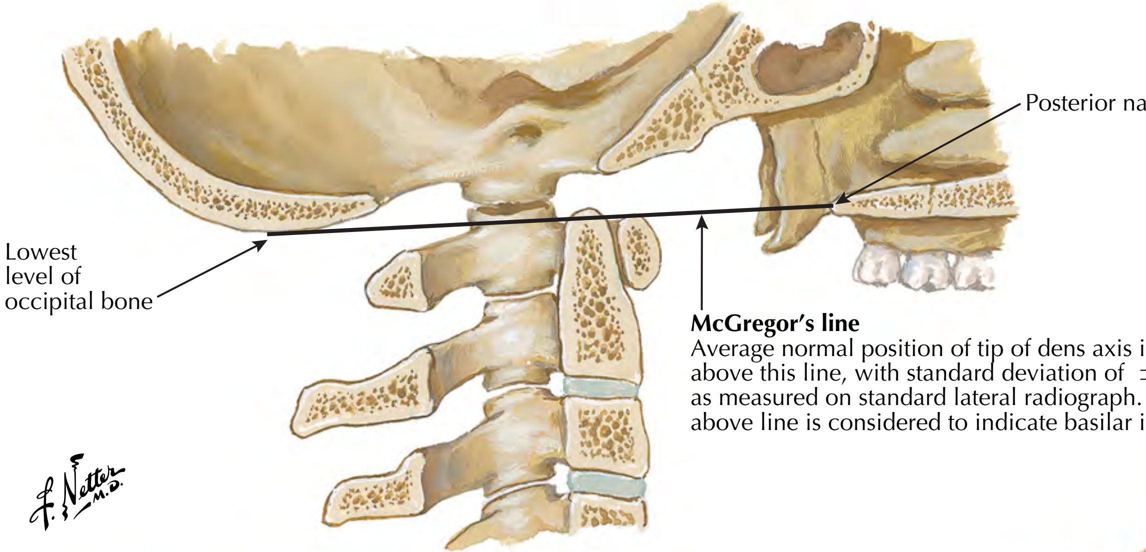
Narrowing of intervertebral foramen
C7 vertebra



Advanced ankylosing spondylitis with uncovertebral arthrosis in C4 and C5

Superior articular process of vertebra
Advanced spondylophyte (osteophyte) formation on uncinate processes
C4
Facet joint ossified owing to advanced osteoarthritic change
Markedly narrowed intervertebral foramen may lead to compression of spinal n.
C5
Inferior articular process of vertebra (with inferior articular facet)
Vertebral body
Groove for spinal n.
Uncovertebral joint fused owing to extensive spondylophyte formation and ossification
Potential for compression of vertebral a. within transverse foramen
Transverse process
Spinous process


Vertebral a.
Opisthion
Posterior atlanto-occipital membrane
Posterior arch of atlas
Nuchal ligament
Posterior atlantoaxial membrane
Spinous process of axis
Ligamentum flavum
Hypoglossal canal
Tectorial membrane of cervical vertebral column
Apical ligament of dens
Anterior atlantooccipital membrane
Superior longitudinal band of cruciform ligament
Anterior arch of atlas
Articular cavity of median atlantoaxial joint
Dens axis
Transverse ligament of atlas
Inferior longitudinal band of cruciform ligament
Anterior longitudinal ligament
Posterior longitudinal ligament


Posterior nasal spine
Lowest level of occipital bone

McGregor's line
Average normal position of tip of dens axis is 1.32 mm above this line, with standard deviation of ±2.6 mm as measured on standard lateral radiograph. Tip >4.5 mm above line is considered to indicate basilar impression.

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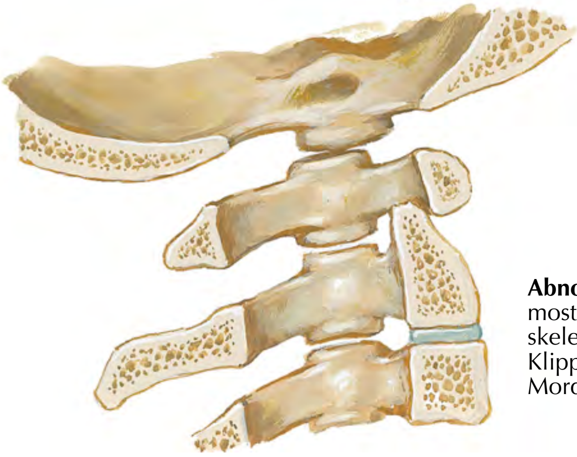
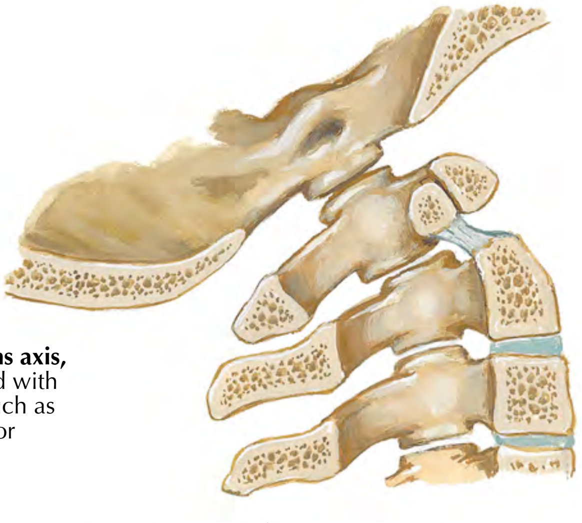


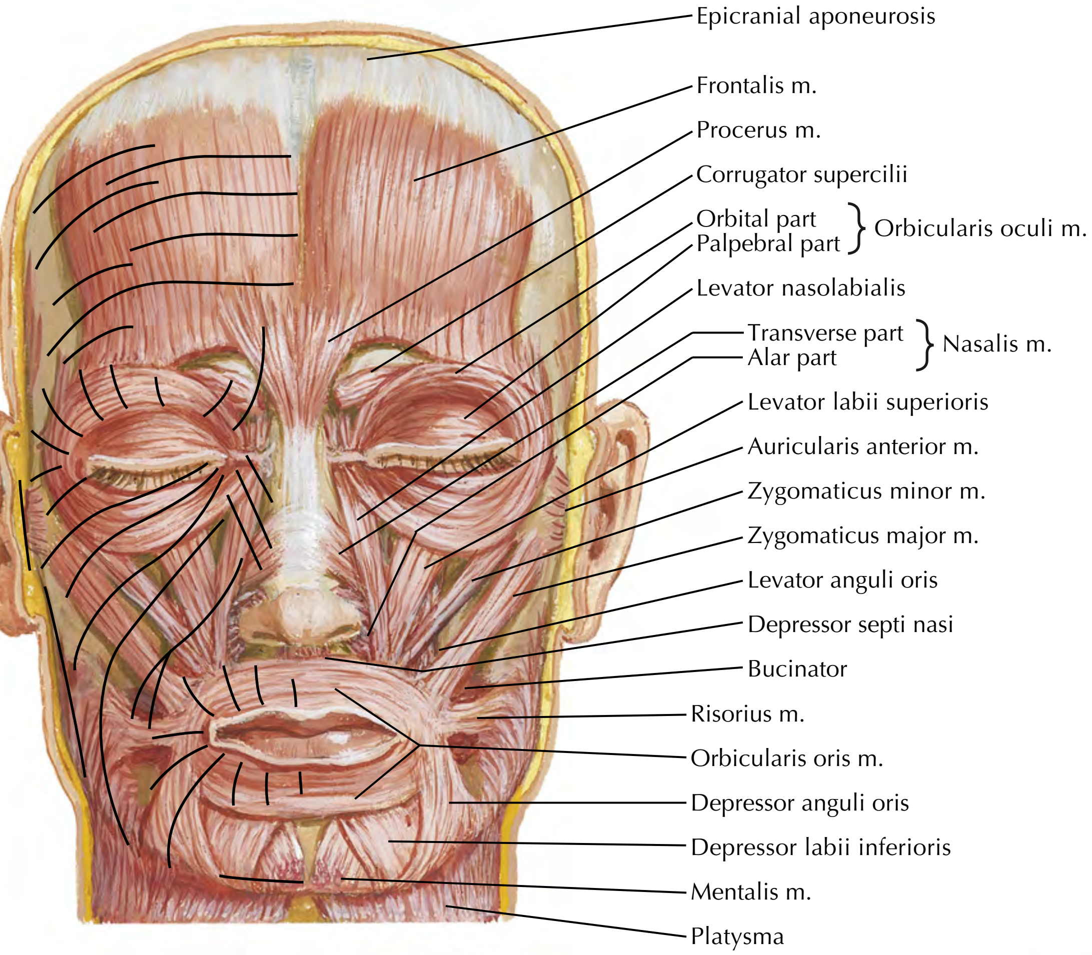
Hypoplastic dens

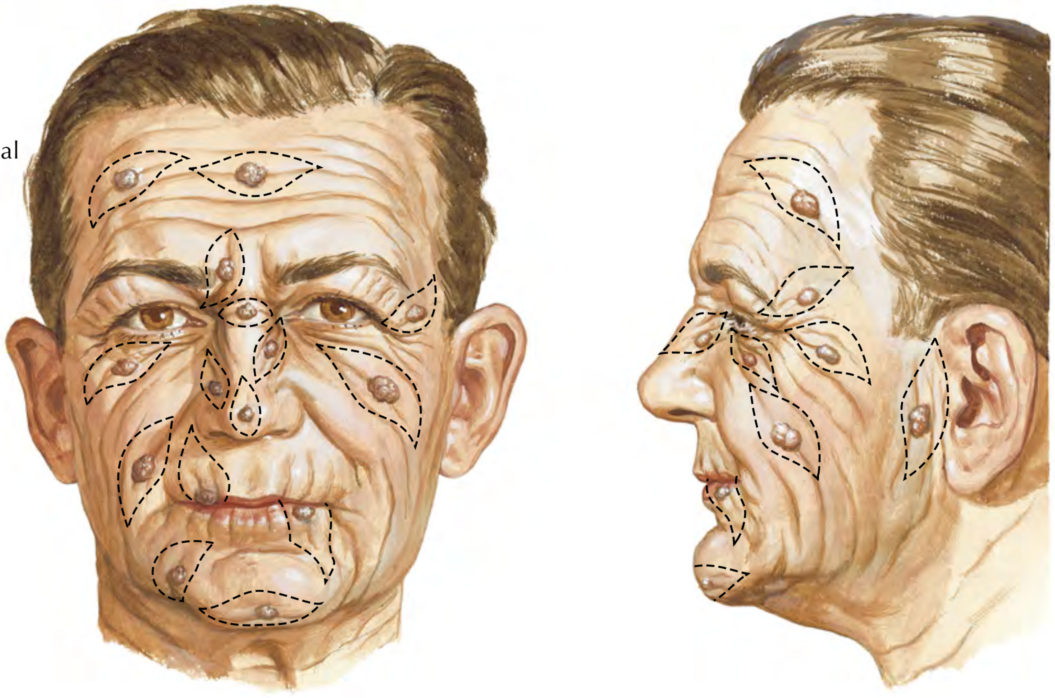


Os odontoideum with fibrous union and narrowing of vertebral canal with head in extension

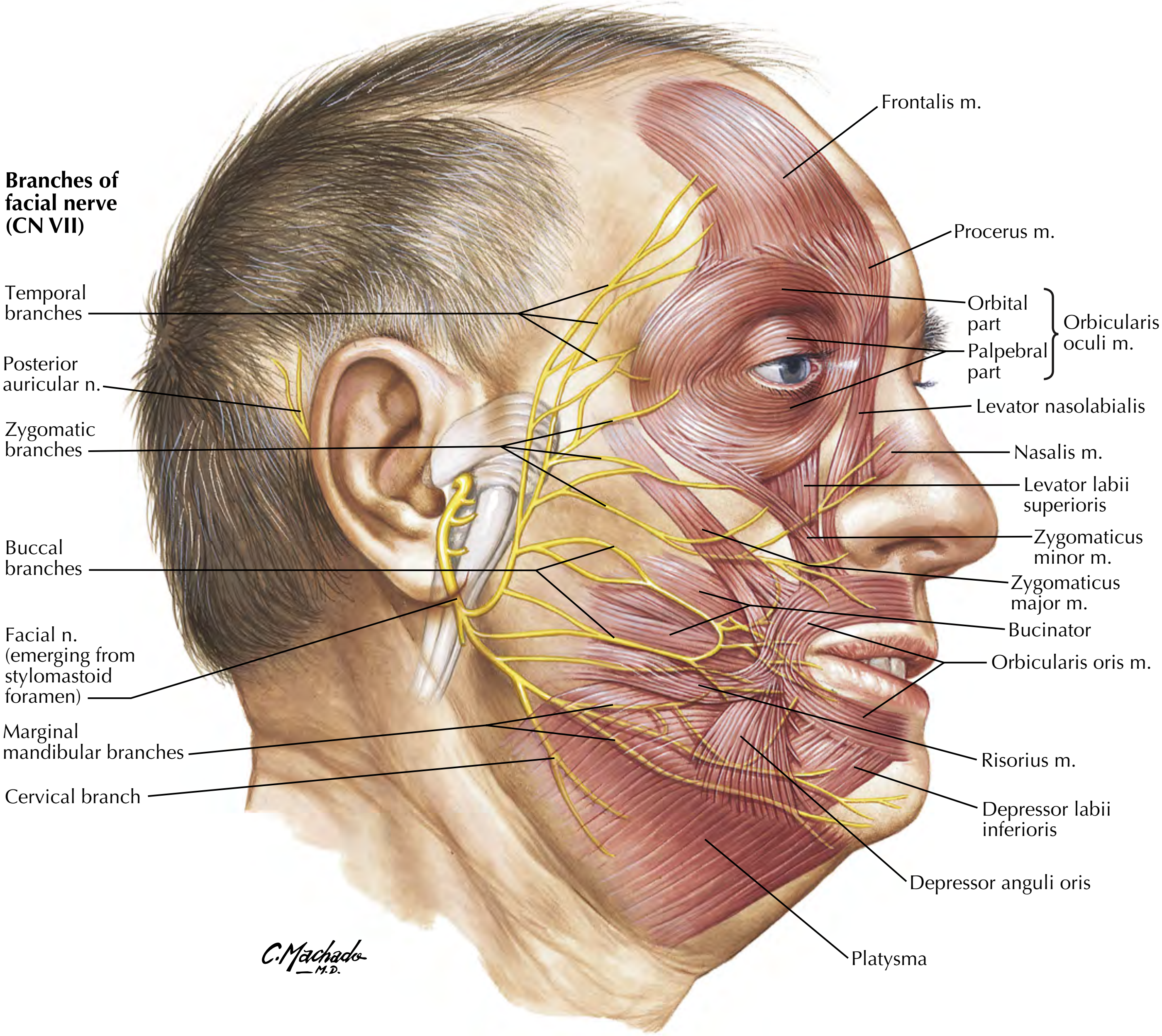
Abnormalities of dens axis, most often associated with skeletal dysplasias such as Klippel-Feil, Down, or Morquio syndromes

Muscles of Facial Expression: Anterior View


Epicranial aponeurosis
Frontalis m.
Procerus m.
Corrugator supercilii
Orbital part
Palpebral part
Orbicularis oculi m.
Levator nasolabialis
Transverse part
Alar part
Nasalis m.
Levator labii superioris
Auricularis anterior m.
Zygomaticus minor m.
Zygomaticus major m.
Levator anguli oris
Depressor septi nasi
Bucinator
Risorius m.
Orbicularis oris m.
Depressor anguli oris
Depressor labii inferioris
Mentalis m.
Platysma

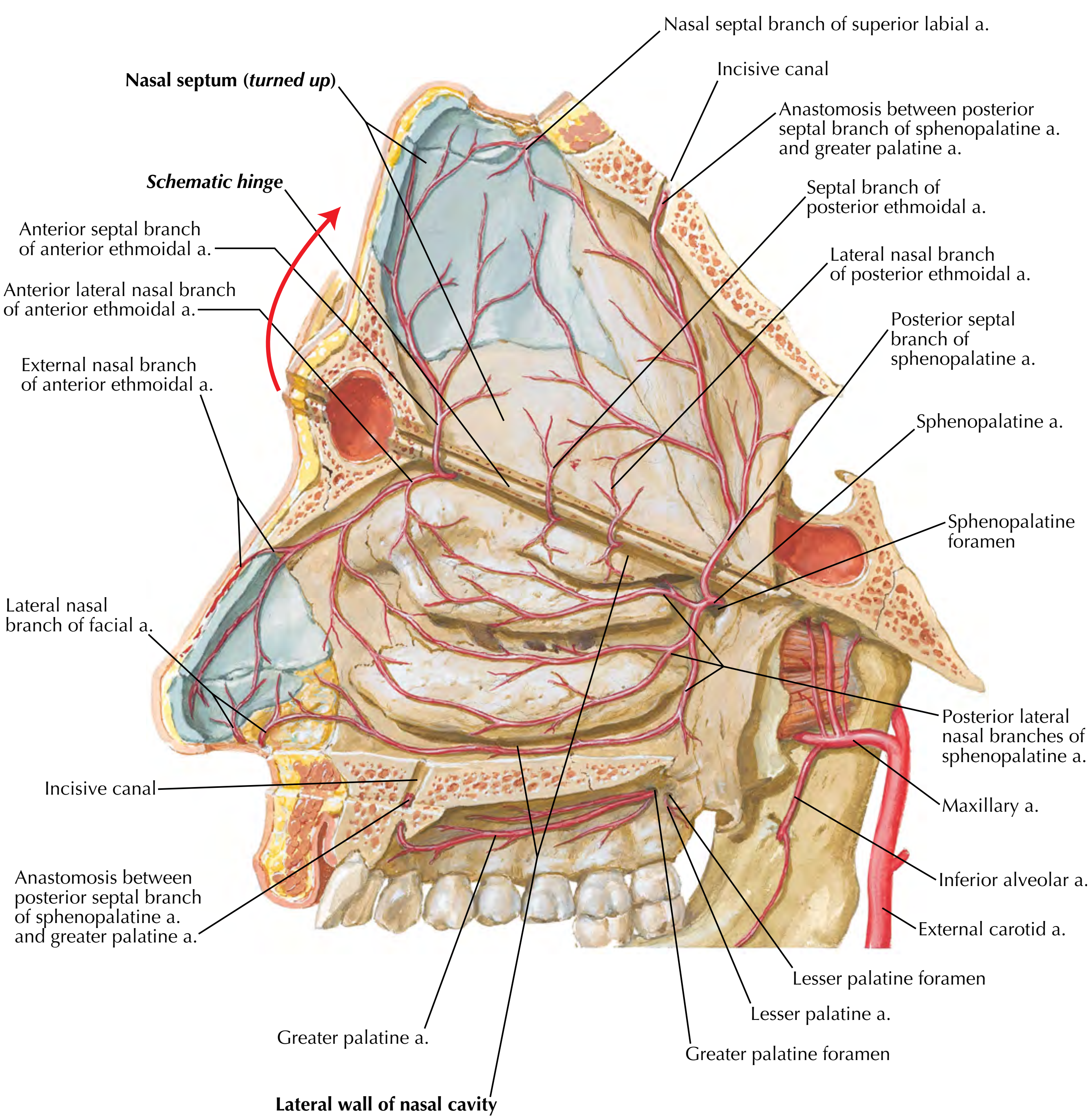


Course of wrinkle lines
(Langer's lines) of skin
is transverse to fiber
direction of facial muscles.
Elliptical incisions for removal
of skin tumors conform to
direction of wrinkle lines.

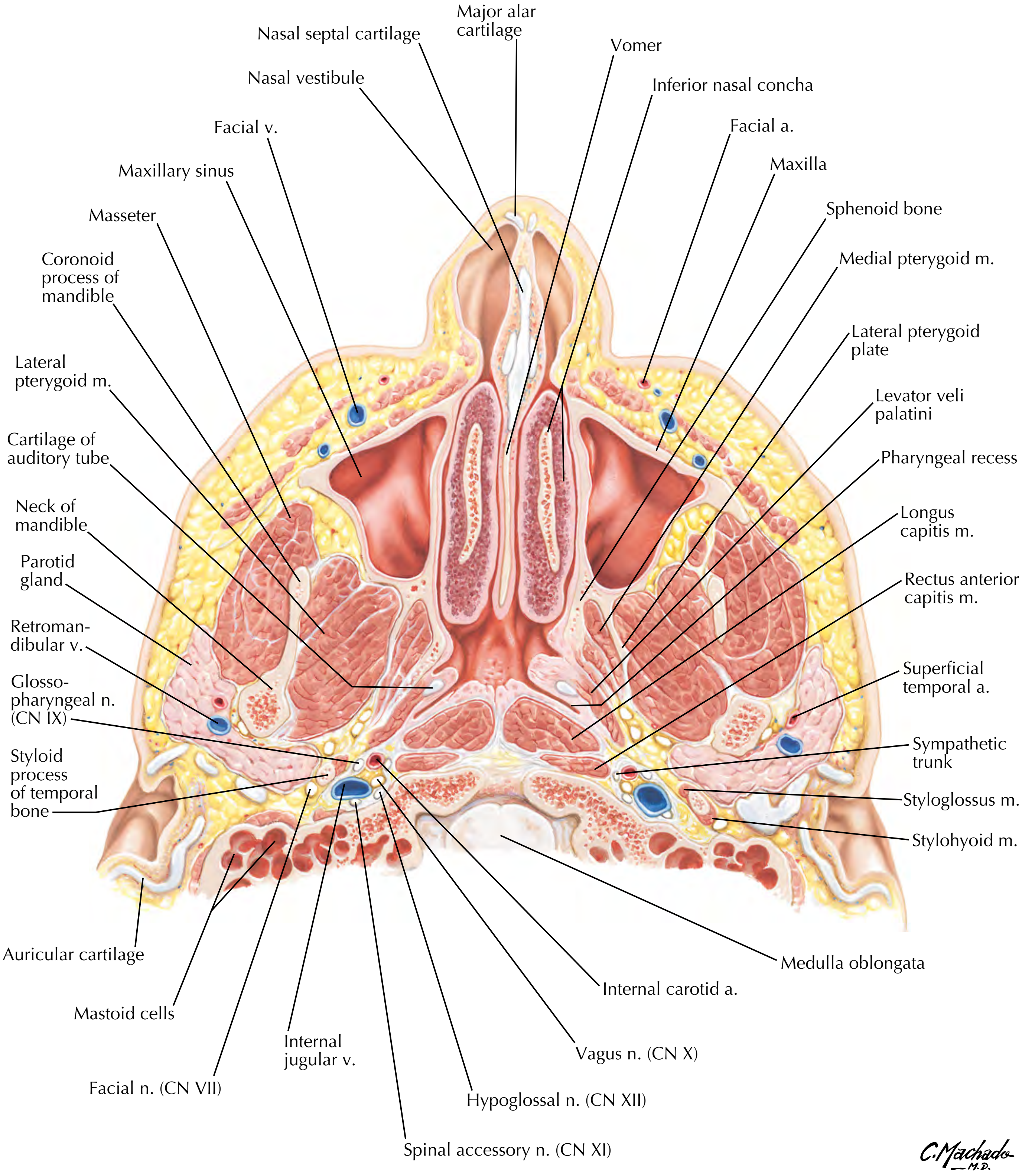

Branches of facial nerve (CN VII)
Temporal branches
Posterior auricular n.
Zygomatic branches
Buccal branches
Facial n. (emerging from stylomastoid foramen)
Marginal mandibular branches
Cervical branch
Frontalis m.
Procerus m.
Orbital part
Palpebral part
Orbicularis oculi m.
Levator nasolabialis
Nasalis m.
Levator labii superioris
Zygomaticus minor m.
Zygomaticus major m.
Bucinator
Orbicularis oris m.
Risorius m.
Depressor labii inferioris
Depressor anguli oris
Platysma
C. Machado M.D.

Arteries of Nasal Cavity: Bony Nasal Septum Turned Up

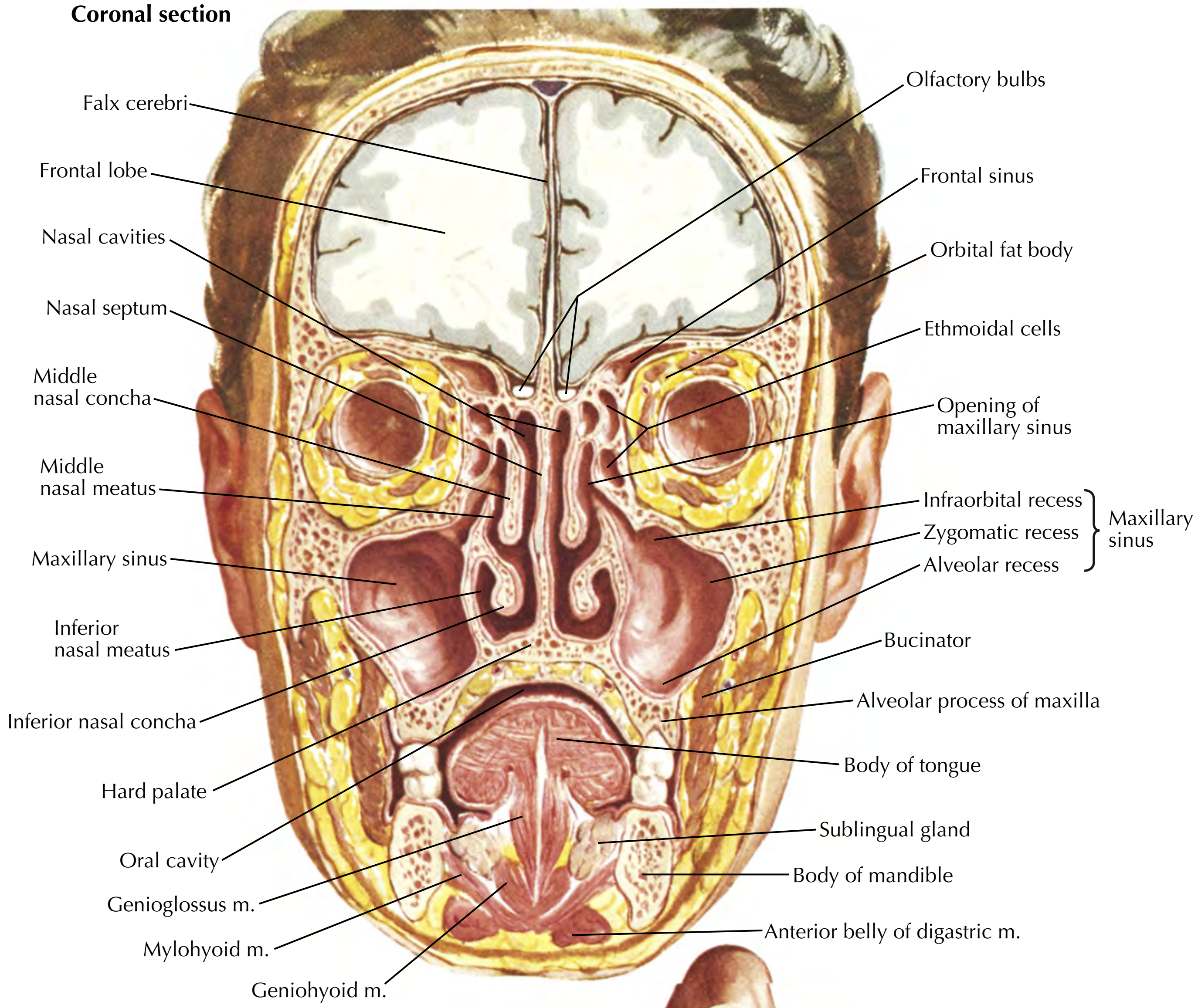
See also **Plates 65, 74, 81**

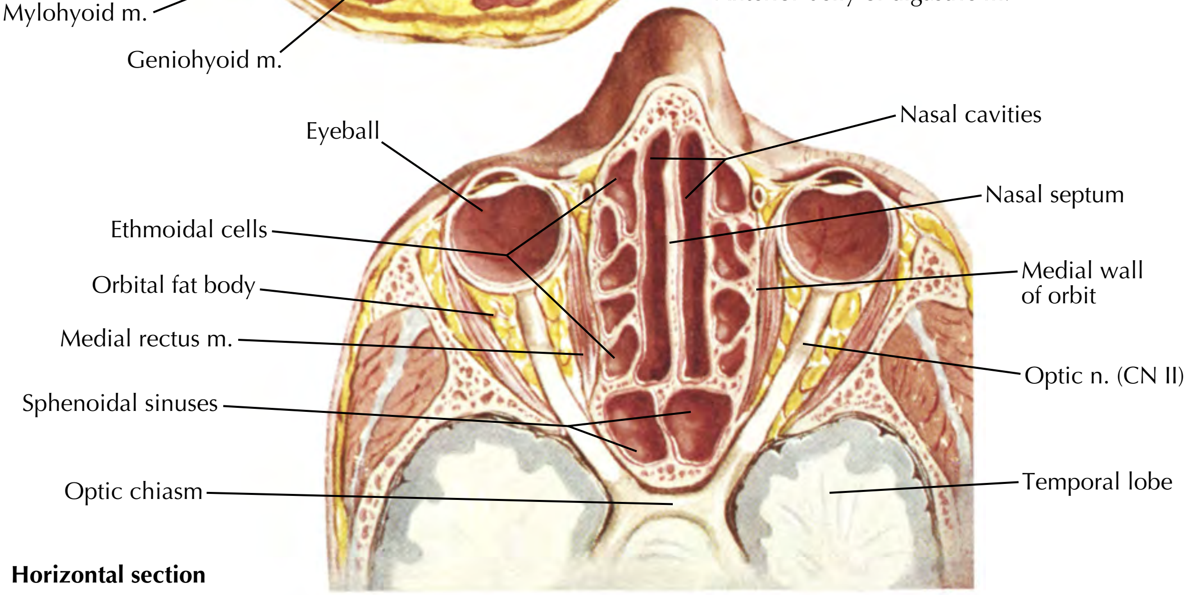

Nasal septal branch of superior labial a.
Incisive canal
Nasal septum (turned up)
Anastomosis between posterior septal branch of sphenopalatine a. and greater palatine a.
Schematic hinge
Septal branch of posterior ethmoidal a.
Anterior septal branch of anterior ethmoidal a.
Lateral nasal branch of posterior ethmoidal a.
Anterior lateral nasal branch of anterior ethmoidal a.
Posterior septal branch of sphenopalatine a.
External nasal branch of anterior ethmoidal a.
Sphenopalatine a.
Sphenopalatine foramen
Lateral nasal branch of facial a.
Posterior lateral nasal branches of sphenopalatine a.
Incisive canal
Maxillary a.
Anastomosis between posterior septal branch of sphenopalatine a. and greater palatine a.
Inferior alveolar a.
External carotid a.
Lesser palatine foramen
Lesser palatine a.
Greater palatine a.
Greater palatine foramen
Lateral wall of nasal cavity

Nose and Maxillary Sinus: Transverse Section


Major alar cartilage
Nasal septal cartilage
Vomer
Nasal vestibule
Inferior nasal concha
Facial v.
Facial a.
Maxillary sinus
Maxilla
Masseter
Sphenoid bone
Coronoid process of mandible
Medial pterygoid m.
Lateral pterygoid m.
Lateral pterygoid plate
Levator veli palatini
Cartilage of auditory tube
Pharyngeal recess
Neck of mandible
Longus capitis m.
Parotid gland
Rectus anterior capitis m.
Retromandibular v.
Superficial temporal a.
Glossopharyngeal n. (CN IX)
Sympathetic trunk
Styloid process of temporal bone
Styloglossus m.
Stylohyoid m.
Auricular cartilage
Medulla oblongata
Internal carotid a.
Mastoid cells
Vagus n. (CN X)
Internal jugular v.
Facial n. (CN VII)
Hypoglossal n. (CN XII)
Spinal accessory n. (CN XI)
C. Machado M.D.

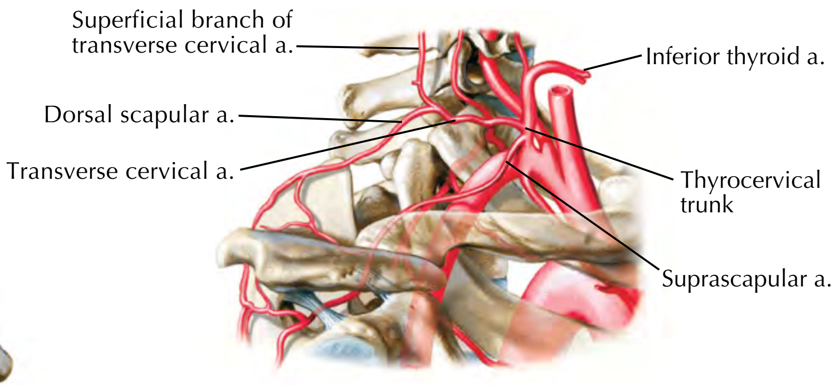
Coronal section


Falx cerebri
Frontal lobe
Nasal cavities
Nasal septum
Middle nasal concha
Middle nasal meatus
Maxillary sinus
Inferior nasal meatus
Inferior nasal concha
Hard palate
Oral cavity
Genioglossus m.
Mylohyoid m.
Geniohyoid m.
Olfactory bulbs
Frontal sinus
Orbital fat body
Ethmoidal cells
Opening of maxillary sinus
Infraorbital recess
Zygomatic recess
Alveolar recess
Maxillary sinus
Bucinator
Alveolar process of maxilla
Body of tongue
Sublingual gland
Body of mandible
Anterior belly of digastric m.

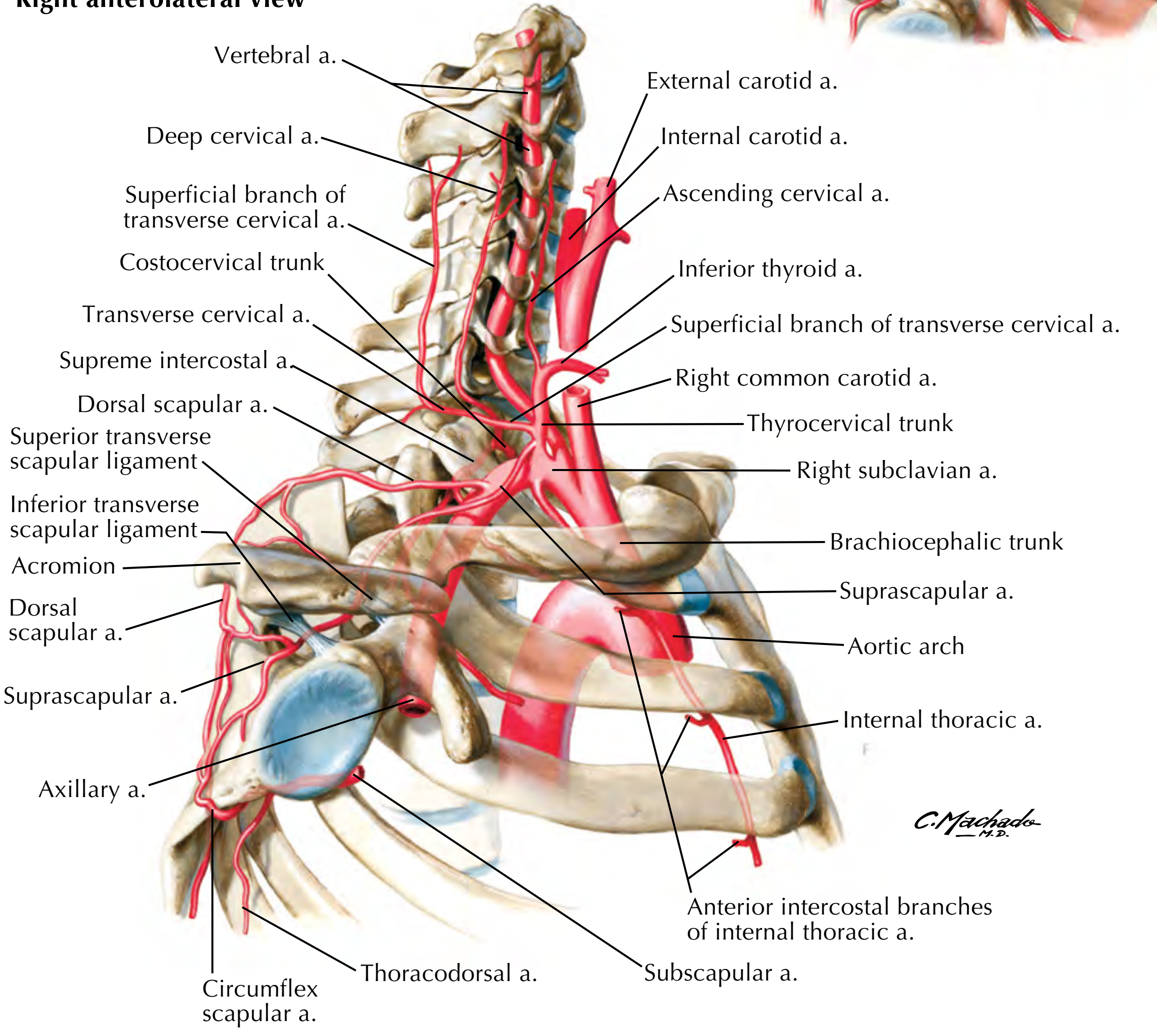

Eyeball
Ethmoidal cells
Orbital fat body
Medial rectus m.
Sphenoidal sinuses
Optic chiasm
Nasal cavities
Nasal septum
Medial wall of orbit
Optic n. (CN II)
Temporal lobe

Horizontal section

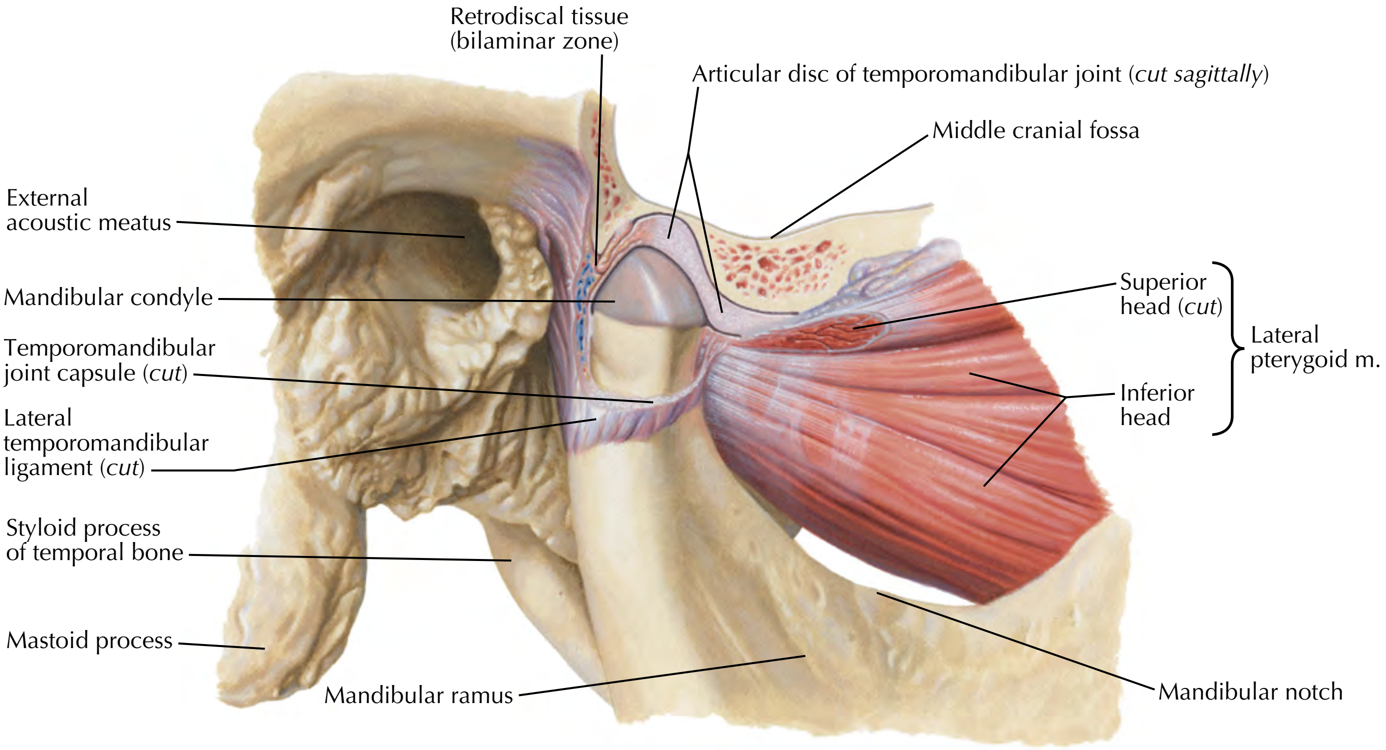
Common origin of superficial branch and dorsal scapular artery from transverse cervical artery (~30%)

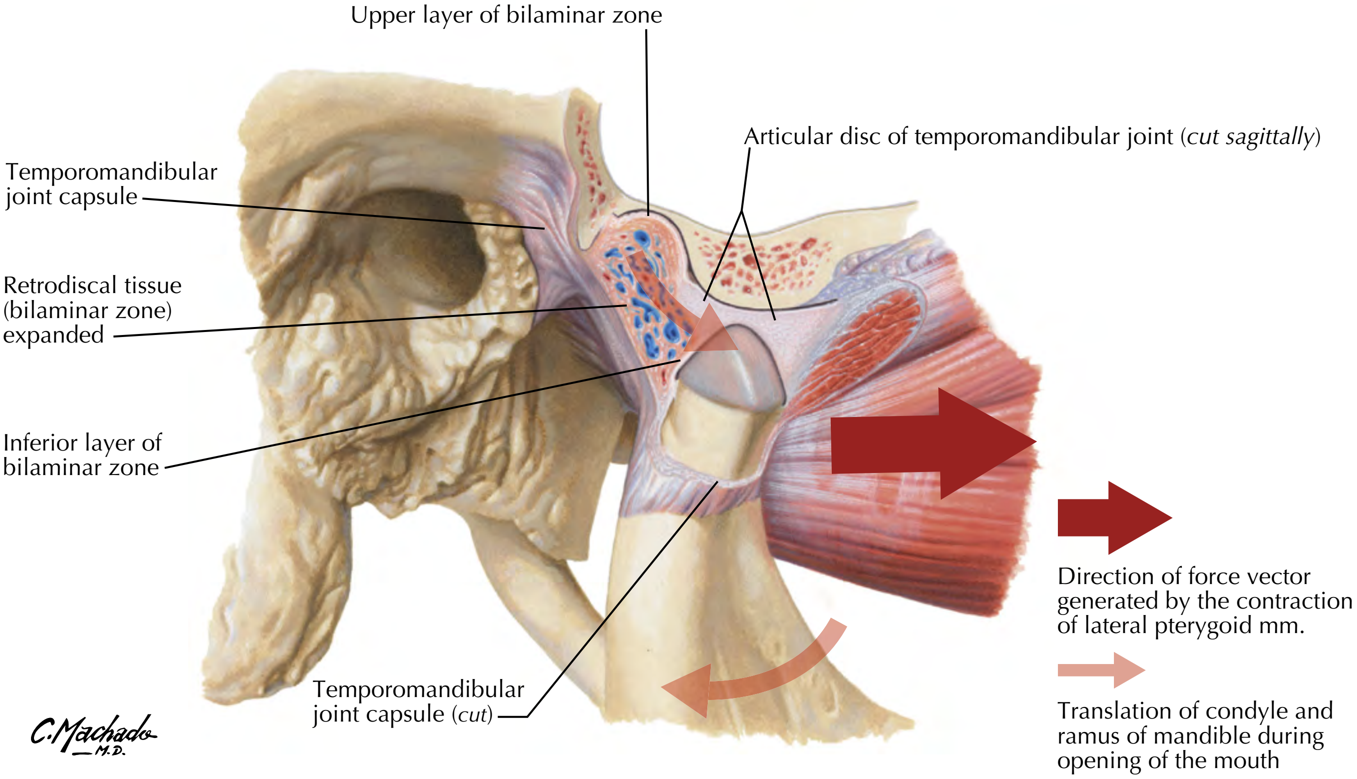

Superficial branch of transverse cervical a.
Inferior thyroid a.
Dorsal scapular a.
Transverse cervical a.
Thyrocervical trunk
Suprascapular a.

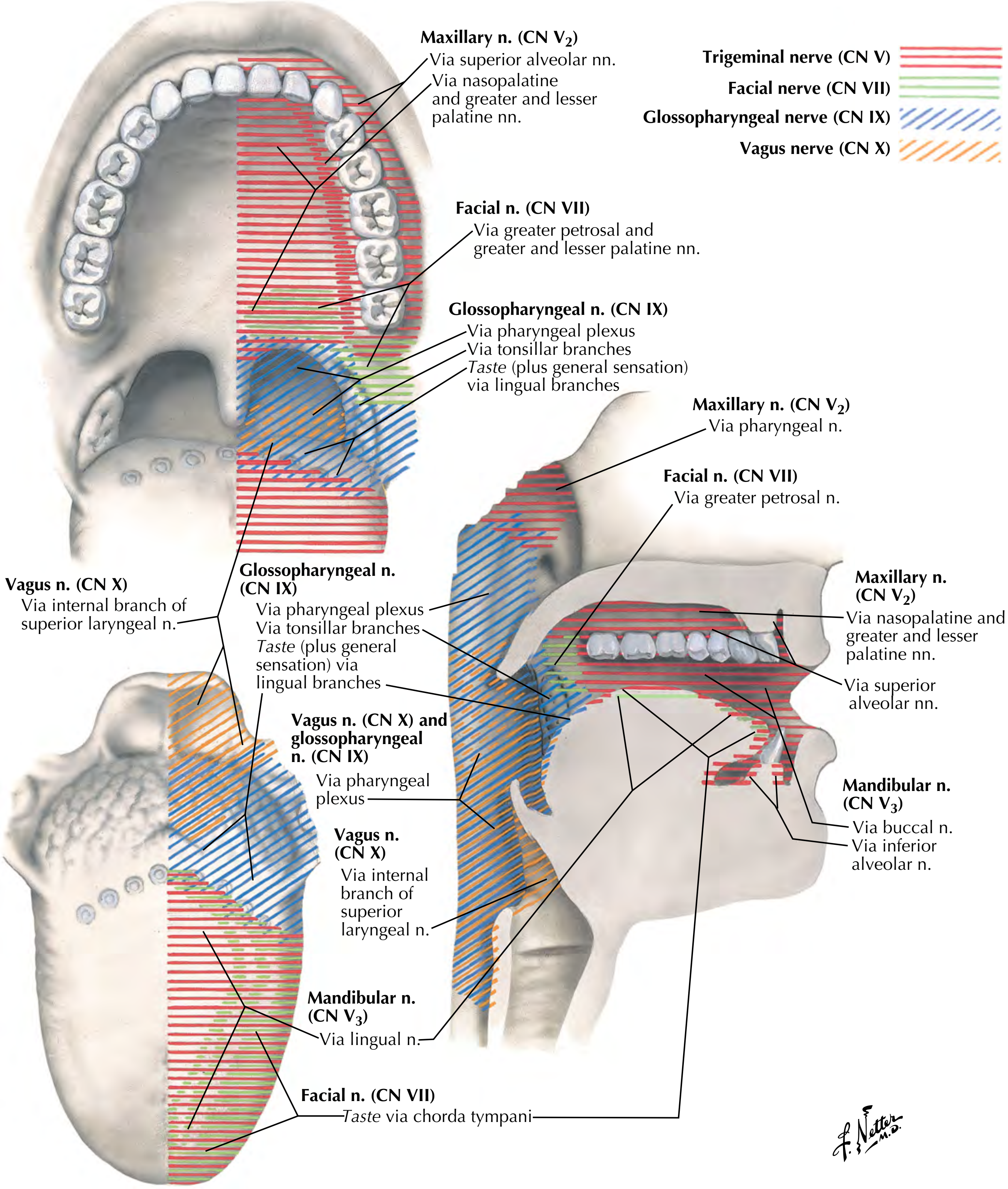
Right anterolateral view


Vertebral a.
Deep cervical a.
Superficial branch of transverse cervical a.
Costocervical trunk
Transverse cervical a.
Supreme intercostal a.
Dorsal scapular a.
Superior transverse scapular ligament
Inferior transverse scapular ligament
Acromion
Dorsal scapular a.
Suprascapular a.
Axillary a.
Circumflex scapular a.
Thoracodorsal a.
Subscapular a.
External carotid a.
Internal carotid a.
Ascending cervical a.
Inferior thyroid a.
Superficial branch of transverse cervical a.
Right common carotid a.
Thyrocervical trunk
Right subclavian a.
Brachiocephalic trunk
Suprascapular a.
Aortic arch
Internal thoracic a.
Anterior intercostal branches of internal thoracic a.
C. Machado M.D.

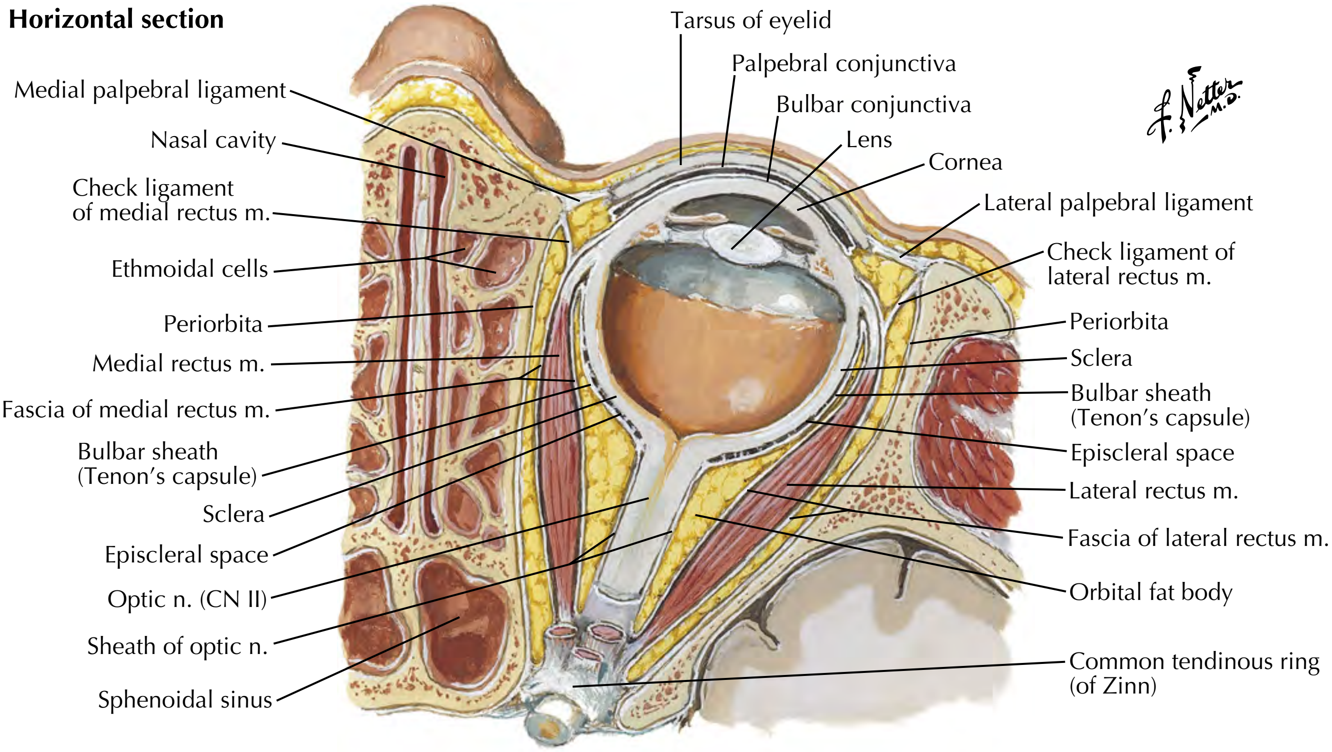
Opening of Mandible


Retrodiscal tissue (bilaminar zone)
Articular disc of temporomandibular joint (*cut sagittally*)
Middle cranial fossa
External acoustic meatus
Mandibular condyle
Temporomandibular joint capsule (*cut*)
Lateral temporomandibular ligament (*cut*)
Styloid process of temporal bone
Mastoid process
Mandibular ramus
Superior head (*cut*)
Inferior head
Lateral pterygoid m.
Mandibular notch

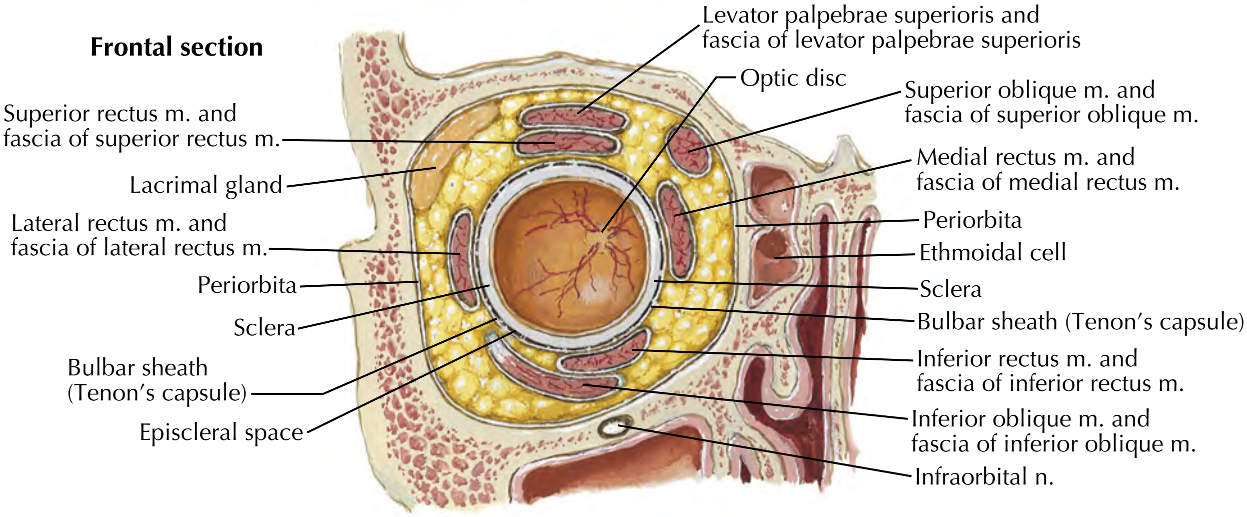

Upper layer of bilaminar zone
Articular disc of temporomandibular joint (*cut sagittally*)
Temporomandibular joint capsule
Retrodiscal tissue (bilaminar zone) expanded
Inferior layer of bilaminar zone
Temporomandibular joint capsule (*cut*)
Direction of force vector generated by the contraction of lateral pterygoid mm.
Translation of condyle and ramus of mandible during opening of the mouth


Trigeminal nerve (CN V) 🟥
Facial nerve (CN VII) 🟩
Glossopharyngeal nerve (CN IX) 🟦
Vagus nerve (CN X) 🟧
Maxillary n. (CN V_2)
Via superior alveolar nn.
Via nasopalatine and greater and lesser palatine nn.
Facial n. (CN VII)
Via greater petrosal and greater and lesser palatine nn.
Glossopharyngeal n. (CN IX)
Via pharyngeal plexus
Via tonsillar branches
Taste (plus general sensation) via lingual branches
Maxillary n. (CN V_2)
Via pharyngeal n.
Facial n. (CN VII)
Via greater petrosal n.
Maxillary n. (CN V_2)
Via nasopalatine and greater and lesser palatine nn.
Via superior alveolar nn.
Mandibular n. (CN V_3)
Via buccal n.
Via inferior alveolar n.
Vagus n. (CN X)
Via internal branch of superior laryngeal n.
Glossopharyngeal n. (CN IX)
Via pharyngeal plexus
Via tonsillar branches
Taste (plus general sensation) via lingual branches
Vagus n. (CN X) and glossopharyngeal n. (CN IX)
Via pharyngeal plexus
Vagus n. (CN X)
Via internal branch of superior laryngeal n.
Mandibular n. (CN V_3)
Via lingual n.
Facial n. (CN VII)
Taste via chorda tympani
F. Netter M.D.

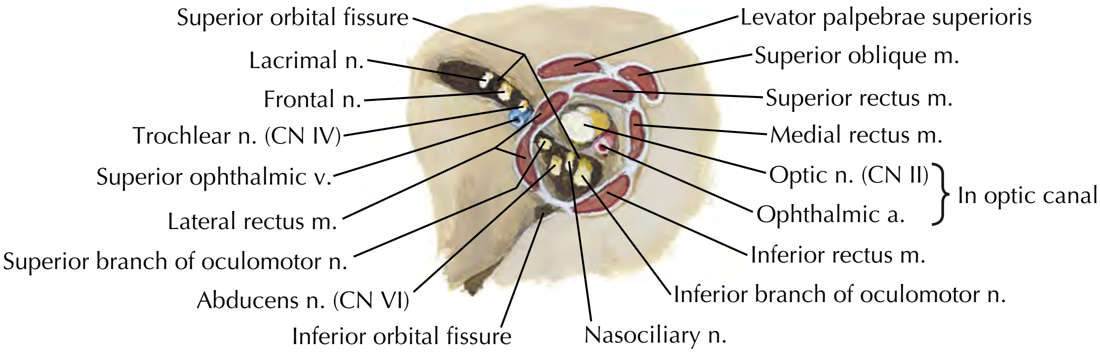
Horizontal section


Medial palpebral ligament
Nasal cavity
Check ligament of medial rectus m.
Ethmoidal cells
Periorbita
Medial rectus m.
Fascia of medial rectus m.
Bulbar sheath (Tenon's capsule)
Sclera
Episcleral space
Optic n. (CN II)
Sheath of optic n.
Sphenoidal sinus
Tarsus of eyelid
Palpebral conjunctiva
Bulbar conjunctiva
Lens
Cornea
Lateral palpebral ligament
Check ligament of lateral rectus m.
Periorbita
Sclera
Bulbar sheath (Tenon's capsule)
Episcleral space
Lateral rectus m.
Fascia of lateral rectus m.
Orbital fat body
Common tendinous ring (of Zinn)

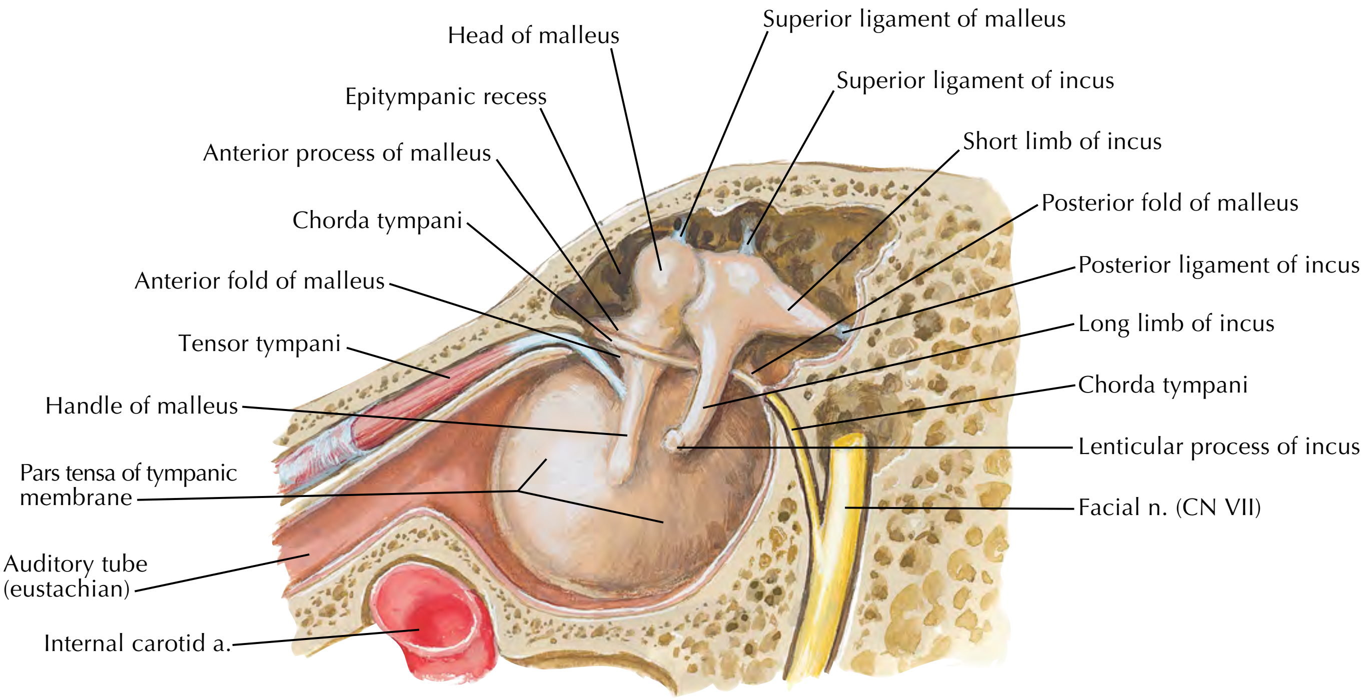
Frontal section


Levator palpebrae superioris and fascia of levator palpebrae superioris
Optic disc
Superior oblique m. and fascia of superior oblique m.
Superior rectus m. and fascia of superior rectus m.
Lacrimal gland
Medial rectus m. and fascia of medial rectus m.
Lateral rectus m. and fascia of lateral rectus m.
Periorbita
Ethmoidal cell
Periorbita
Sclera
Sclera
Bulbar sheath (Tenon's capsule)
Bulbar sheath (Tenon's capsule)
Inferior rectus m. and fascia of inferior rectus m.
Episcleral space
Inferior oblique m. and fascia of inferior oblique m.
Infraorbital n.

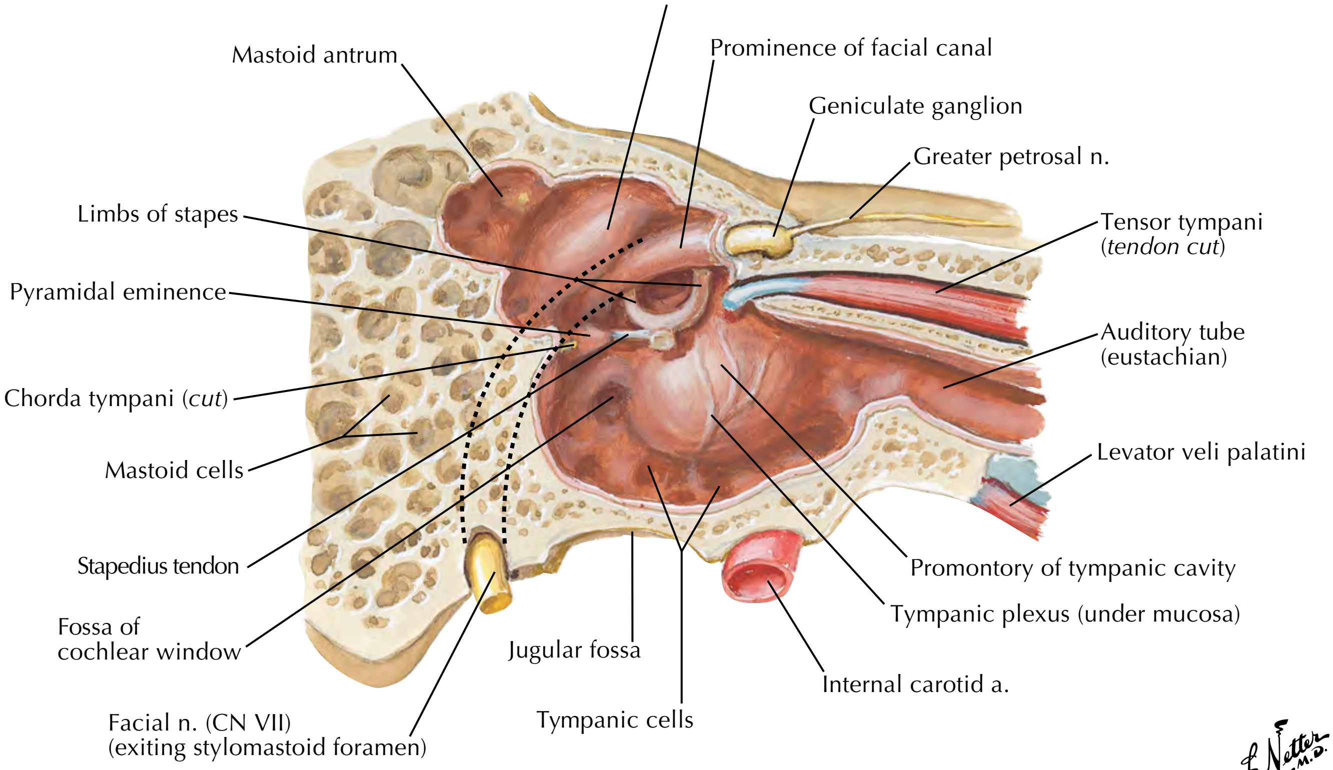
Muscle attachments and nerves and vessels entering orbit


Superior orbital fissure
Levator palpebrae superioris
Lacrimal n.
Superior oblique m.
Frontal n.
Superior rectus m.
Trochlear n. (CN IV)
Medial rectus m.
Superior ophthalmic v.
Optic n. (CN II)
Ophthalmic a.
In optic canal
Lateral rectus m.
Inferior rectus m.
Superior branch of oculomotor n.
Inferior branch of oculomotor n.
Abducens n. (CN VI)
Inferior orbital fissure
Nasociliary n.

Lateral wall of tympanic cavity: medial (internal) view


Head of malleus
Superior ligament of malleus
Epitympanic recess
Superior ligament of incus
Anterior process of malleus
Short limb of incus
Chorda tympani
Posterior fold of malleus
Anterior fold of malleus
Posterior ligament of incus
Tensor tympani
Long limb of incus
Handle of malleus
Chorda tympani
Lenticular process of incus
Pars tensa of tympanic membrane
Facial n. (CN VII)
Auditory tube (eustachian)
Internal carotid a.

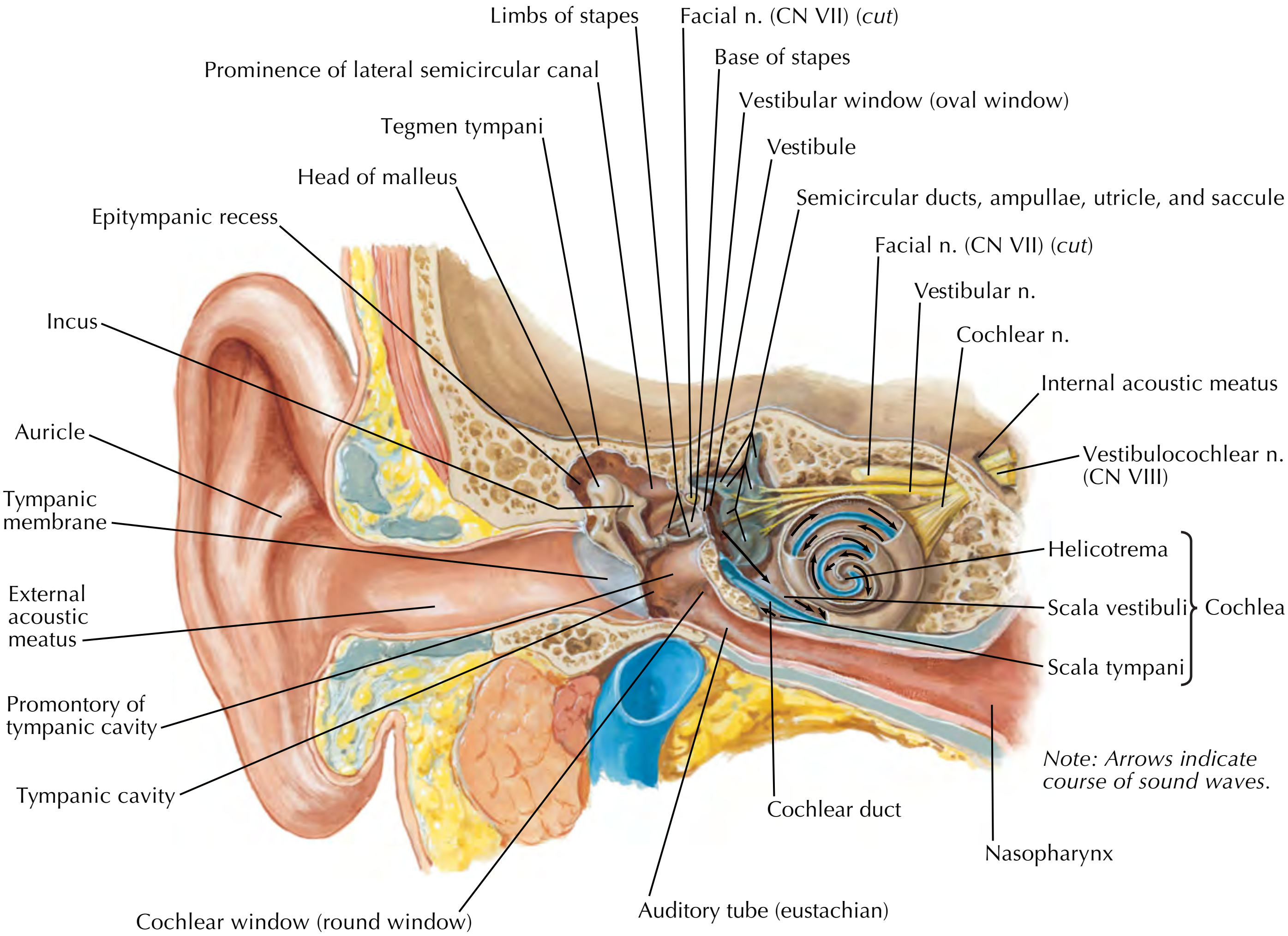
Labyrinthine wall of tympanic cavity: lateral view


Prominence of lateral semicircular canal
Mastoid antrum
Prominence of facial canal
Geniculate ganglion
Greater petrosal n.
Limbs of stapes
Tensor tympani (*tendon cut*)
Pyramidal eminence
Auditory tube (eustachian)
Chorda tympani (*cut*)
Mastoid cells
Levator veli palatini
Stapedius tendon
Promontory of tympanic cavity
Tympanic plexus (under mucosa)
Fossa of cochlear window
Jugular fossa
Internal carotid a.
Facial n. (CN VII) (exiting stylomastoid foramen)
Tympanic cells

F. Netter M.D.

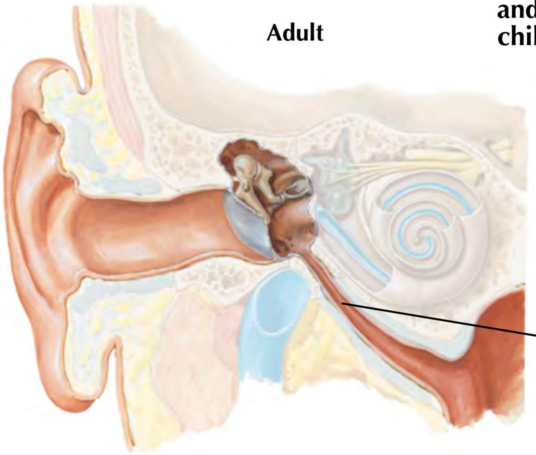
Anatomy of Pediatric Ear

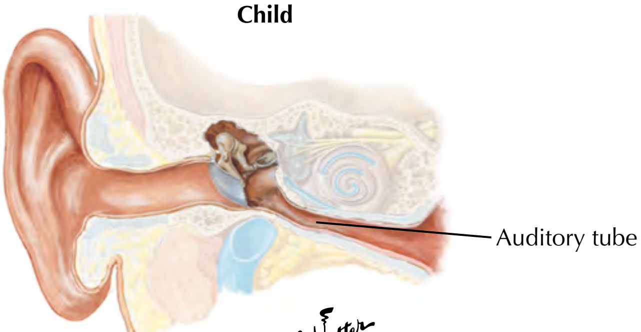
Pediatric ear: frontal section


Limbs of stapes
Facial n. (CN VII) (*cut*)
Base of stapes
Prominence of lateral semicircular canal
Vestibular window (oval window)
Tegmen tympani
Vestibule
Head of malleus
Semicircular ducts, ampullae, utricle, and saccule
Epitympanic recess
Facial n. (CN VII) (*cut*)
Vestibular n.
Cochlear n.
Incus
Internal acoustic meatus
Auricle
Vestibulocochlear n. (CN VIII)
Tympanic membrane
Helicotrema
External acoustic meatus
Scala vestibuli
Cochlea
Scala tympani
Promontory of tympanic cavity
Tympanic cavity
Cochlear duct
Nasopharynx
Cochlear window (round window)
Auditory tube (eustachian)

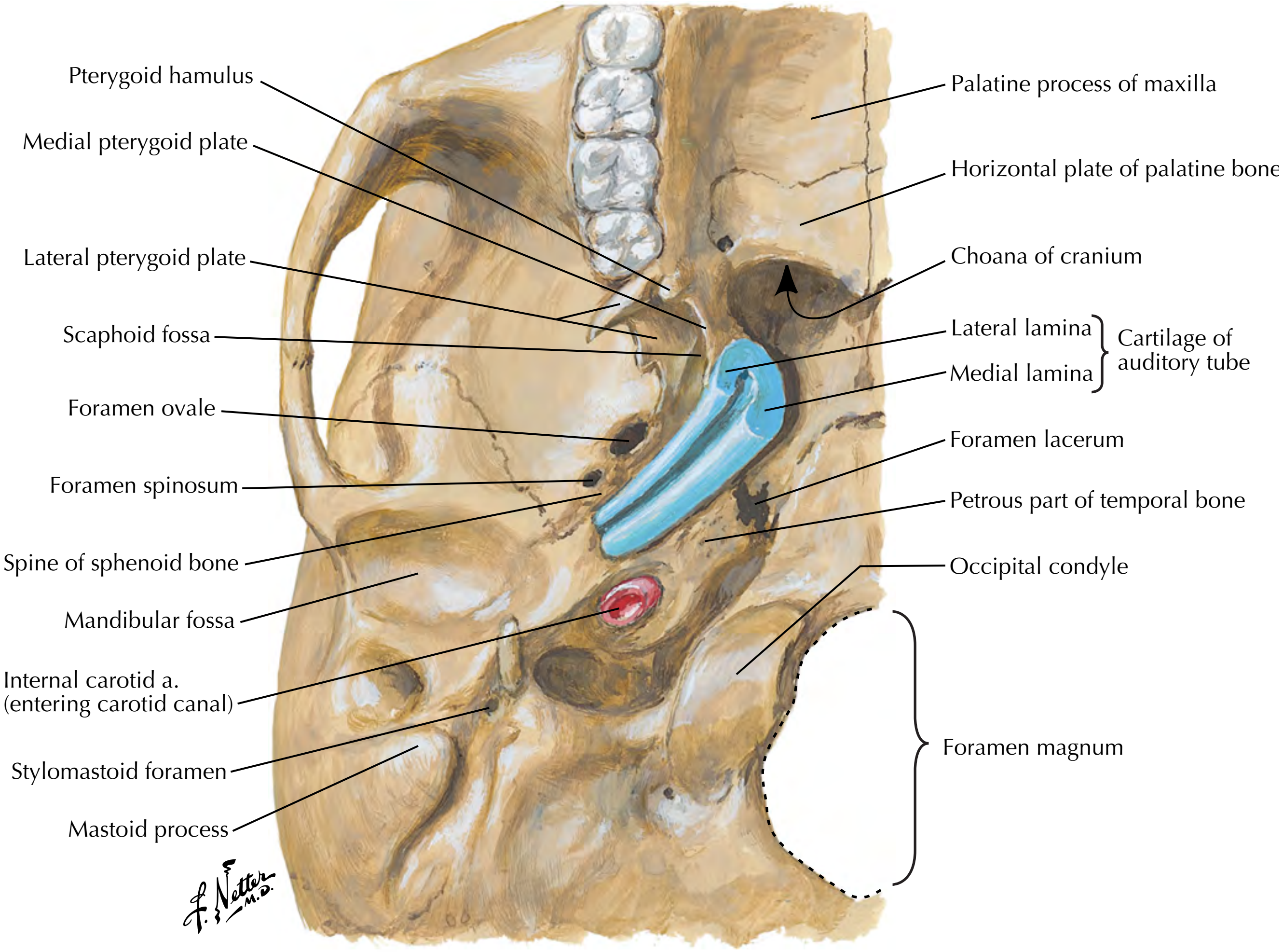
Note: Arrows indicate course of sound waves.

The auditory tube is shorter and more horizontal in children than in adults.


Adult
Auditory tube


Child
Auditory tube

Cartilaginous part of auditory tube at base of skull: inferior view


Pterygoid hamulus
Medial pterygoid plate
Lateral pterygoid plate
Scaphoid fossa
Foramen ovale
Foramen spinosum
Spine of sphenoid bone
Mandibular fossa
Internal carotid a.
(entering carotid canal)
Stylomastoid foramen
Mastoid process
Palatine process of maxilla
Horizontal plate of palatine bone
Choana of cranium
Lateral lamina
Medial lamina
Cartilage of auditory tube
Foramen lacerum
Petrous part of temporal bone
Occipital condyle
Foramen magnum
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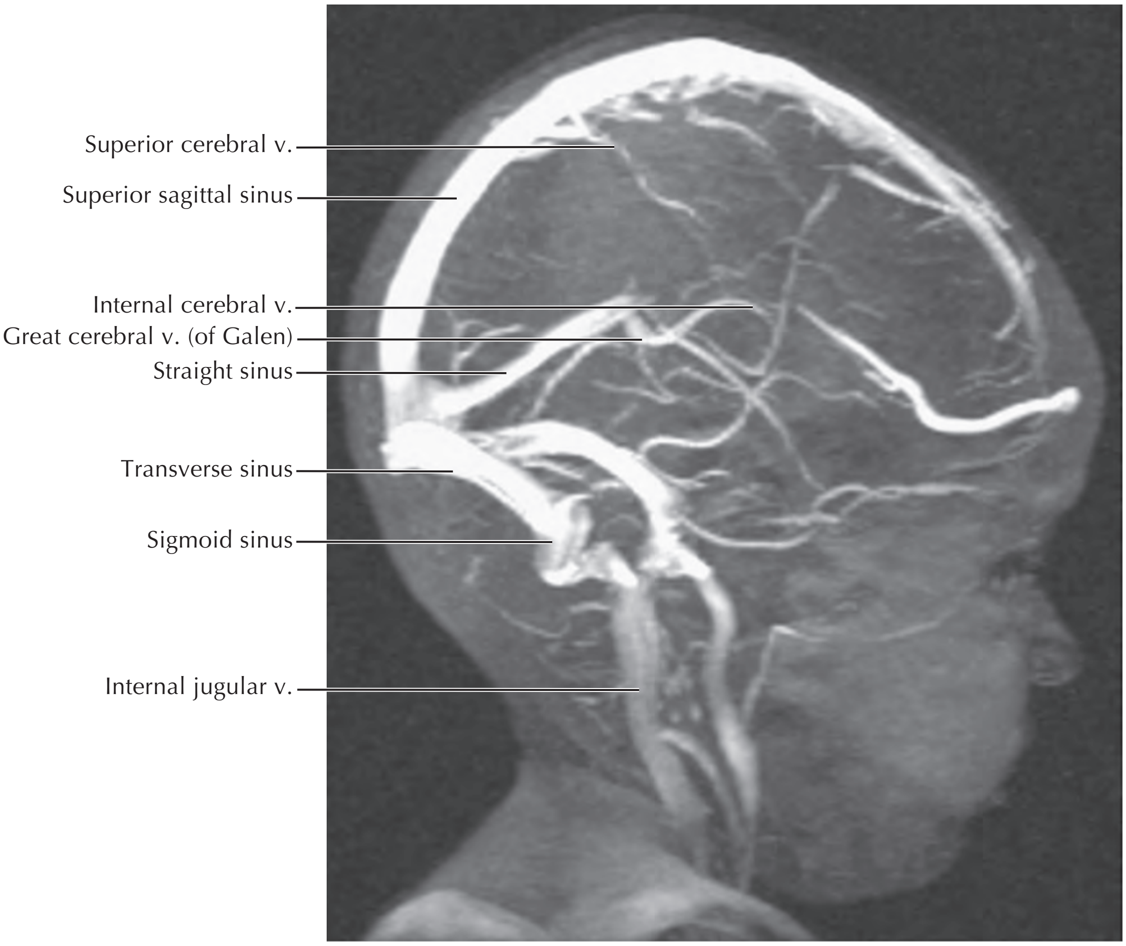
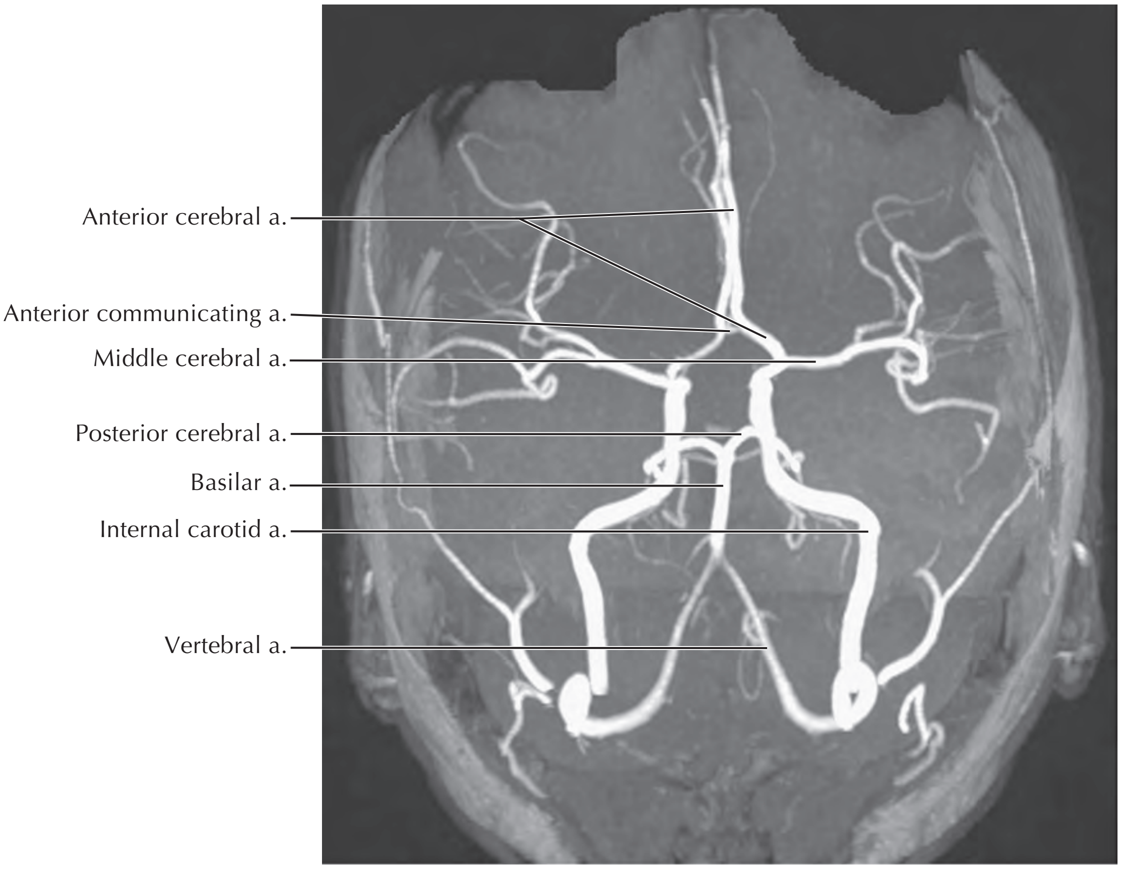
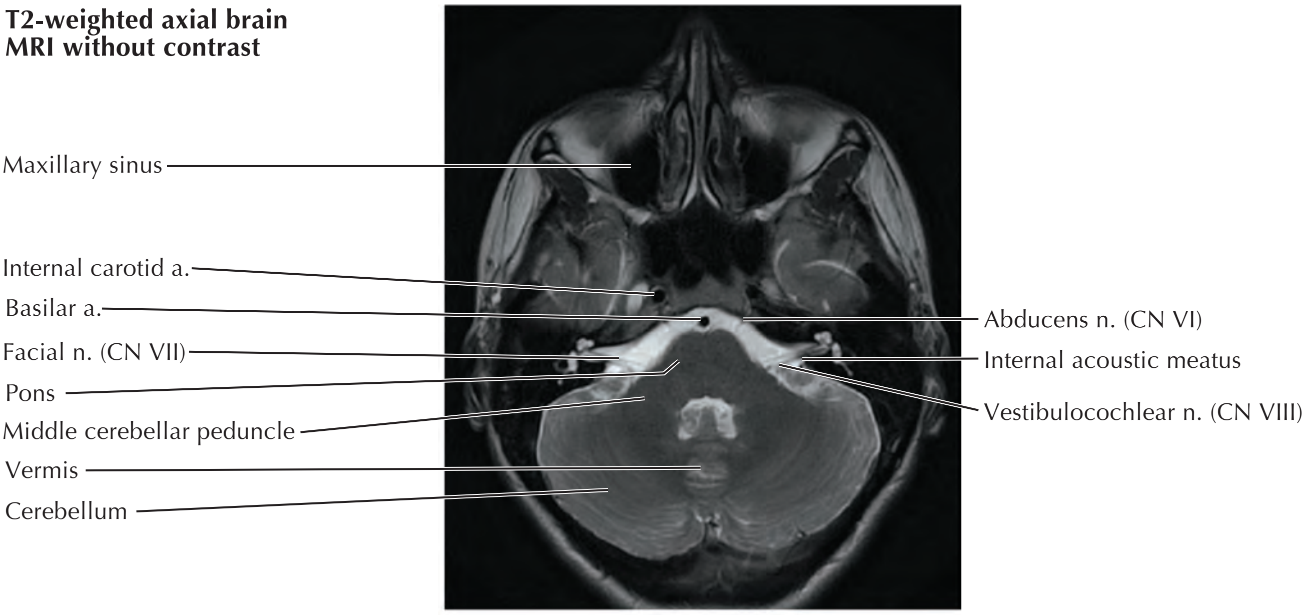
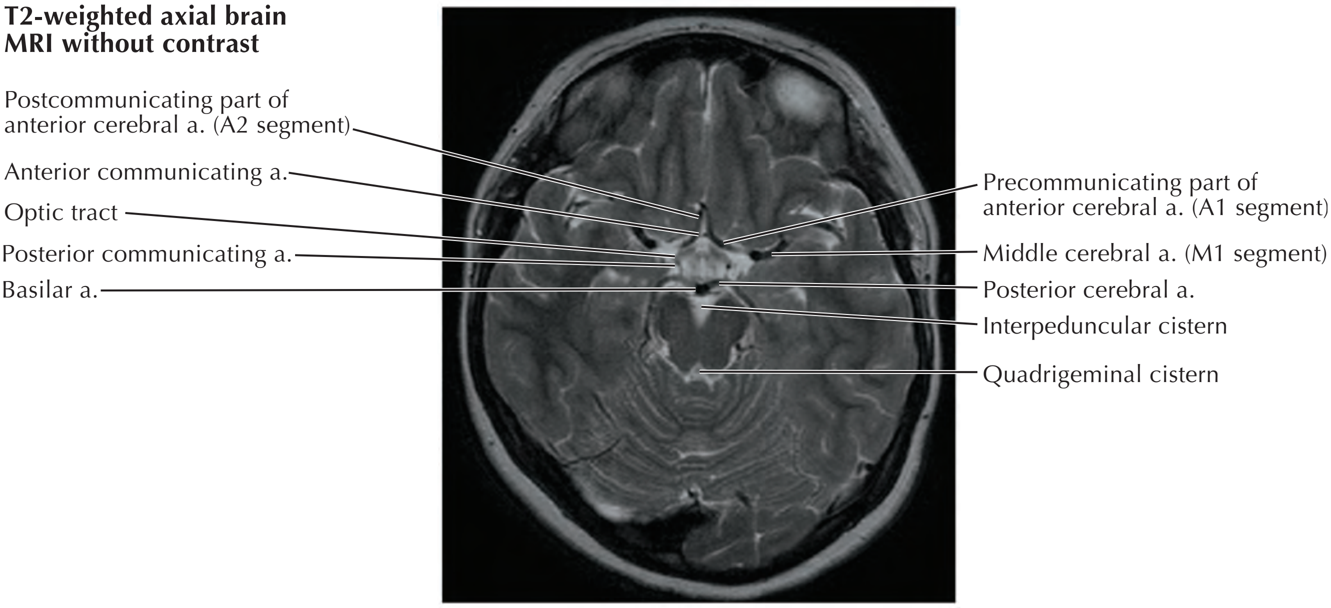

Superior cerebral v.
Superior sagittal sinus
Internal cerebral v.
Great cerebral v. (of Galen)
Straight sinus
Transverse sinus
Sigmoid sinus
Internal jugular v.


Anterior cerebral a.
Anterior communicating a.
Middle cerebral a.
Posterior cerebral a.
Basilar a.
Internal carotid a.
Vertebral a.

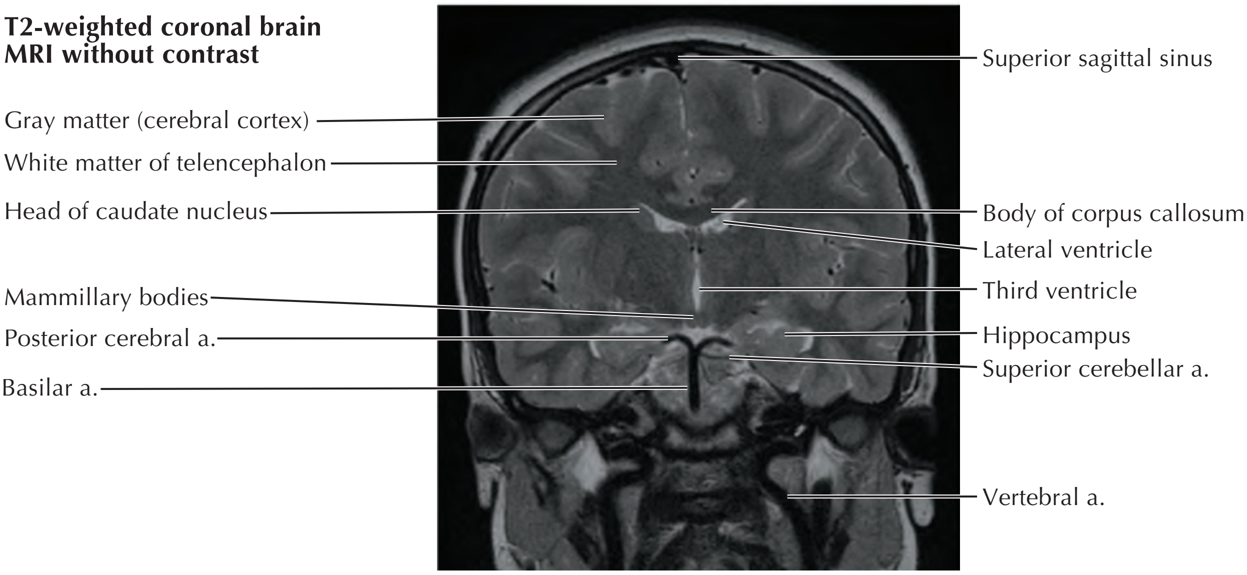
T2-weighted axial brain MRI without contrast


Maxillary sinus
Internal carotid a.
Basilar a.
Facial n. (CN VII)
Pons
Middle cerebellar peduncle
Vermis
Cerebellum
Abducens n. (CN VI)
Internal acoustic meatus
Vestibulocochlear n. (CN VIII)

T2-weighted axial brain MRI without contrast


Postcommunicating part of anterior cerebral a. (A2 segment)
Anterior communicating a.
Optic tract
Posterior communicating a.
Basilar a.
Precommunicating part of anterior cerebral a. (A1 segment)
Middle cerebral a. (M1 segment)
Posterior cerebral a.
Interpeduncular cistern
Quadrigeminal cistern

T2-weighted coronal brain MRI without contrast


Superior sagittal sinus
Gray matter (cerebral cortex)
White matter of telencephalon
Head of caudate nucleus
Body of corpus callosum
Lateral ventricle
Third ventricle
Mammillary bodies
Posterior cerebral a.
Hippocampus
Superior cerebellar a.
Basilar a.
Vertebral a.

BACK

3

Surface Anatomy 178
Vertebral Column 179–185
Spinal Cord 186–194
Muscles and Nerves 195–199
Cross-Sectional Anatomy 200–201
Structures with High Clinical Significance Table 3.1
Muscles Tables 3.2–3.4
Electronic Bonus Plates BP 33–BP 40

ELECTRONIC BONUS PLATES

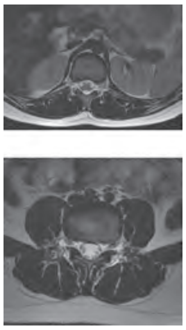
BP 33 Ligaments of Vertebral Column

BP 34 Cervical Spine: Radiographs

BP 35 Cervical Spine: MRI and Radiograph

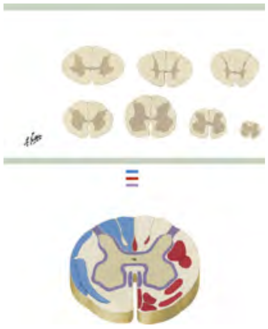
BP 36 Thoracolumbar Spine: Lateral Radiograph

BP 37 Lumbar Vertebrae: Radiographs



BP 38 Lumbar Spine: MRIs

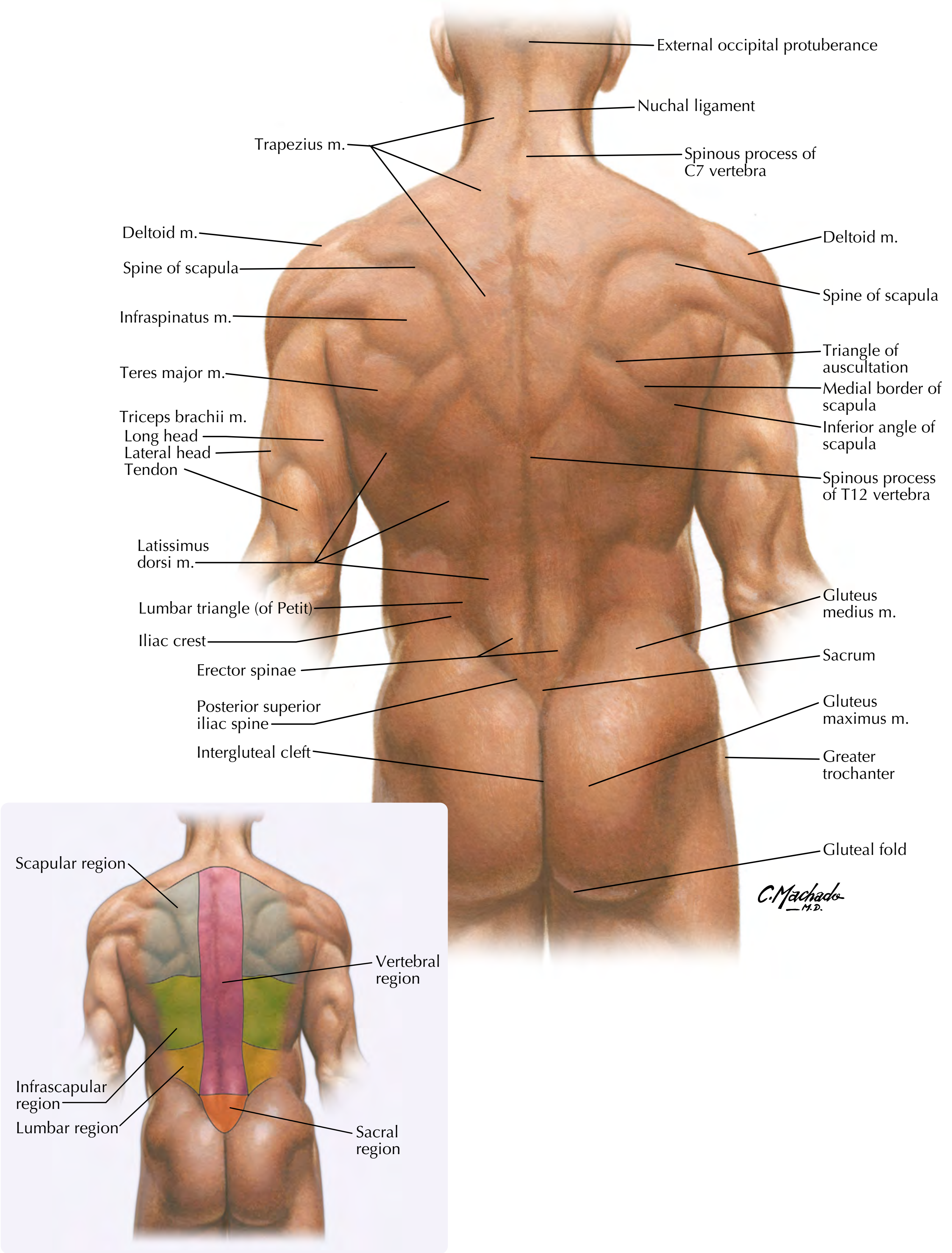
BP 39 Vertebral Veins: Detail Showing Venous Communications



BP 40 Spinal Cord Cross Sections: Fiber Tracts

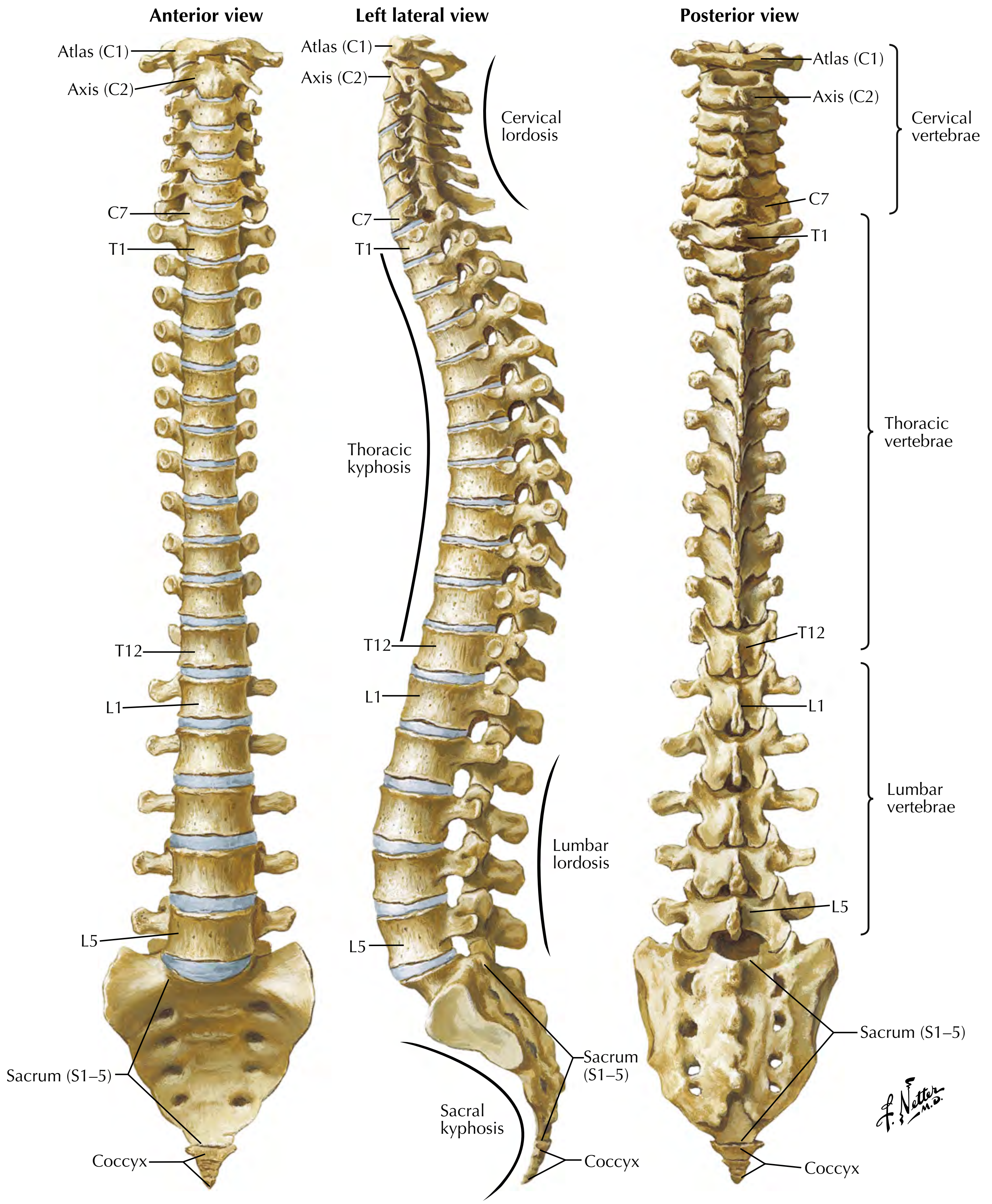
Surface Anatomy of Back

See also **Plates 179, 188, 195**

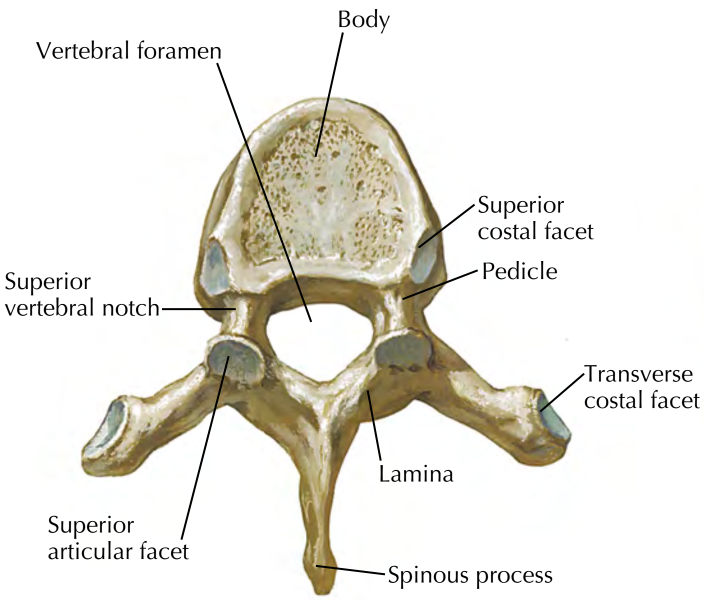

External occipital protuberance
Nuchal ligament
Trapezius m.
Spinous process of C7 vertebra
Deltoid m.
Deltoid m.
Spine of scapula
Spine of scapula
Infraspinatus m.
Triangle of auscultation
Teres major m.
Medial border of scapula
Inferior angle of scapula
Triceps brachii m.
Long head
Lateral head
Tendon
Spinous process of T12 vertebra
Latissimus dorsi m.
Gluteus medius m.
Lumbar triangle (of Petit)
Iliac crest
Sacrum
Erector spinae
Posterior superior iliac spine
Gluteus maximus m.
Intergluteal cleft
Greater trochanter
Gluteal fold
C.Machado M.D.
Scapular region
Vertebral region
Infrascapular region
Lumbar region
Sacral region

Vertebral Column

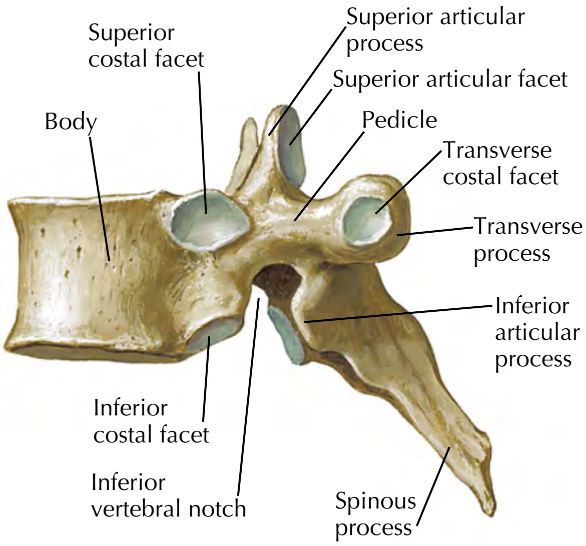
See also **Plates 45, 203, 268, BP 36**


Anterior view
Atlas (C1)
Axis (C2)
C7
T1
T12
L1
L5
Sacrum (S1–5)
Coccyx
Left lateral view
Atlas (C1)
Axis (C2)
Cervical lordosis
C7
T1
Thoracic kyphosis
T12
L1
Lumbar lordosis
L5
Sacrum (S1–5)
Sacral kyphosis
Coccyx
Posterior view
Atlas (C1)
Axis (C2)
Cervical vertebrae
C7
T1
Thoracic vertebrae
T12
L1
Lumbar vertebrae
L5
Sacrum (S1–5)
Coccyx

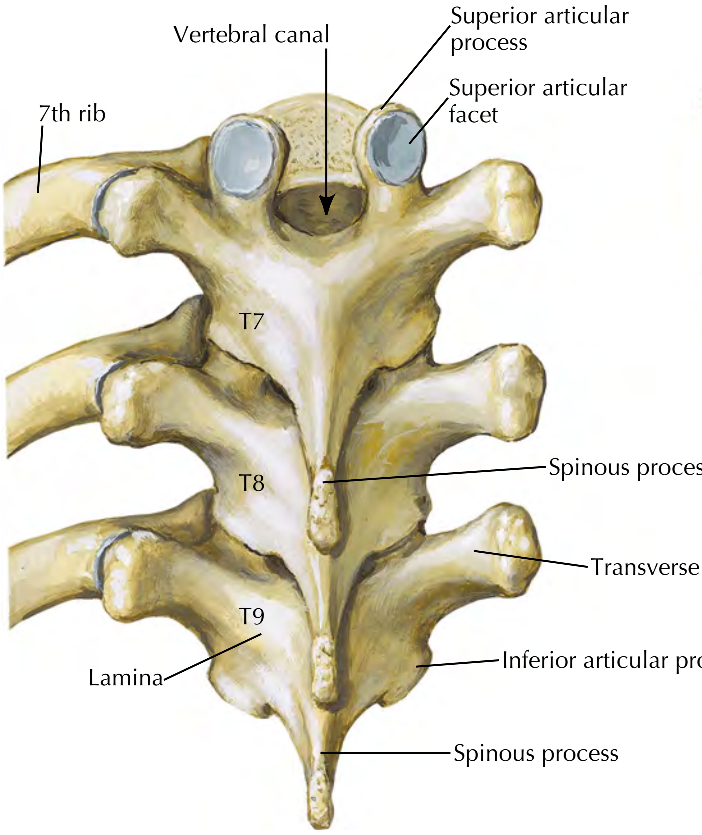
See also Plate BP 33


Body
Vertebral foramen
Superior costal facet
Pedicle
Superior vertebral notch
Transverse costal facet
Lamina
Superior articular facet
Spinous process

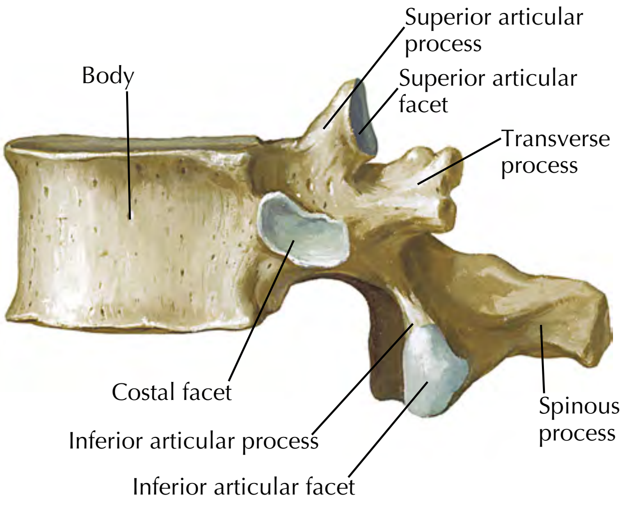
T6 vertebra (superior view)


Superior articular process
Superior costal facet
Superior articular facet
Body
Pedicle
Transverse costal facet
Transverse process
Inferior articular process
Inferior costal facet
Inferior vertebral notch
Spinous process

T6 vertebra (lateral view)


Superior articular process
Vertebral canal
Superior articular facet
7th rib
T7
T8
Spinous process
Transverse process
T9
Inferior articular process
Lamina
Spinous process

T7, T8, and T9 vertebrae (posterior view)

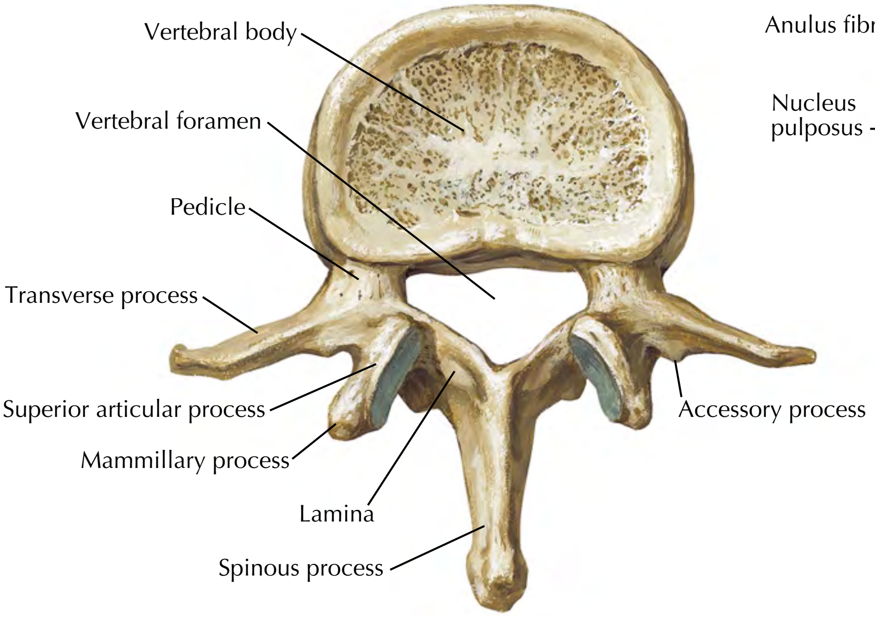

Superior articular process
Body
Superior articular facet
Transverse process
Costal facet
Spinous process
Inferior articular process
Inferior articular facet

T12 vertebra (lateral view)

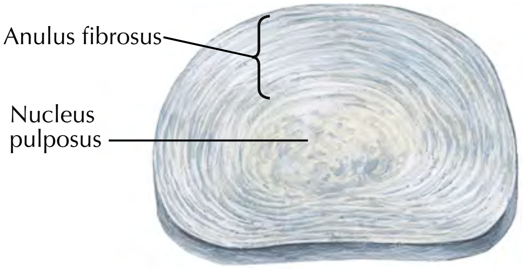
F. Netter M.D.

Lumbar Vertebrae

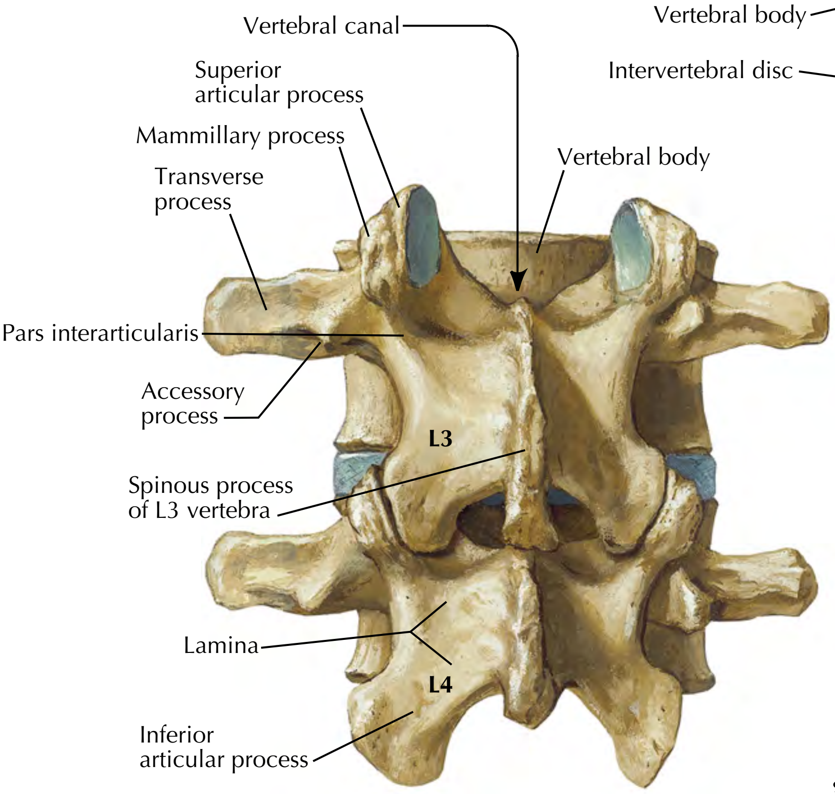
See also **Plates BP 33, BP 37**


Vertebral body
Vertebral foramen
Pedicle
Transverse process
Superior articular process
Mammillary process
Lamina
Spinous process
Accessory process

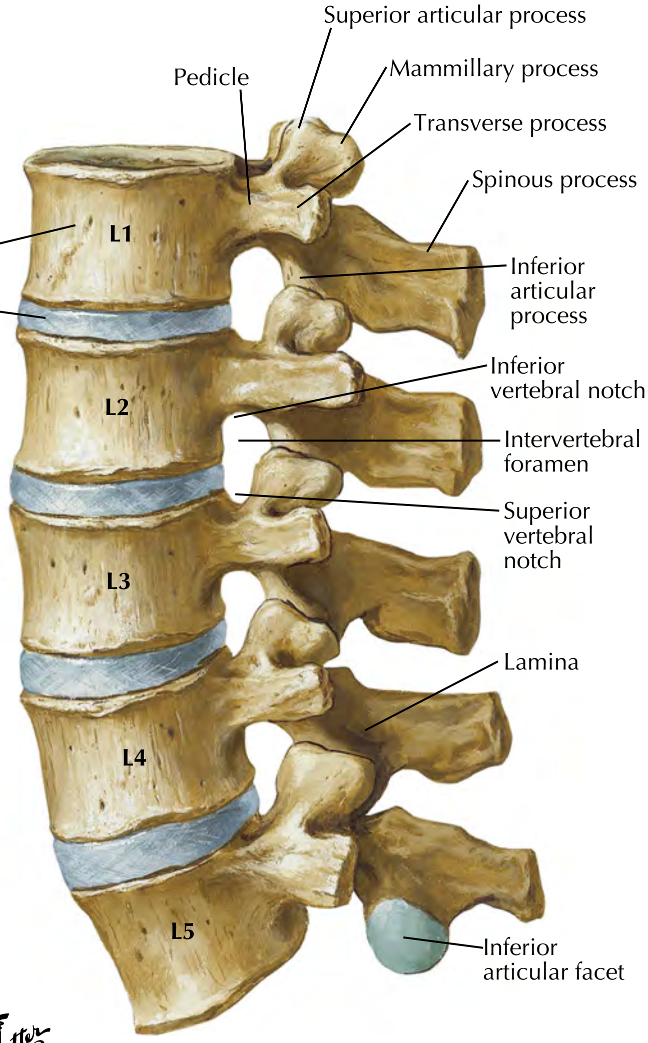
L2 vertebra (superior view)


Anulus fibrosus
Nucleus pulposus

Intervertebral disc

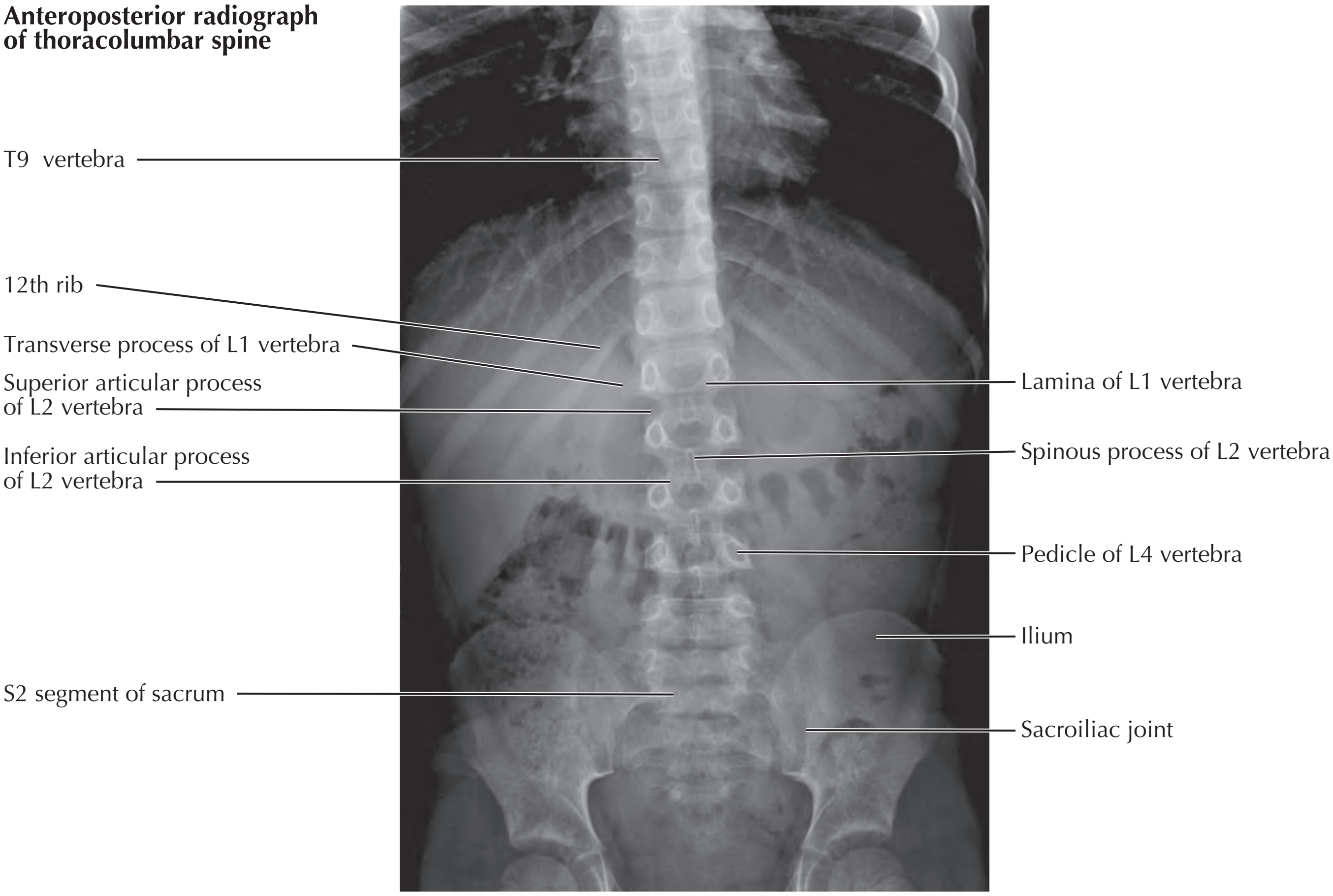

Vertebral canal
Superior articular process
Mammillary process
Transverse process
Vertebral body
Pars interarticularis
Accessory process
L3
Spinous process of L3 vertebra
Lamina
L4
Inferior articular process

L3 and L4 vertebrae (posterior view)

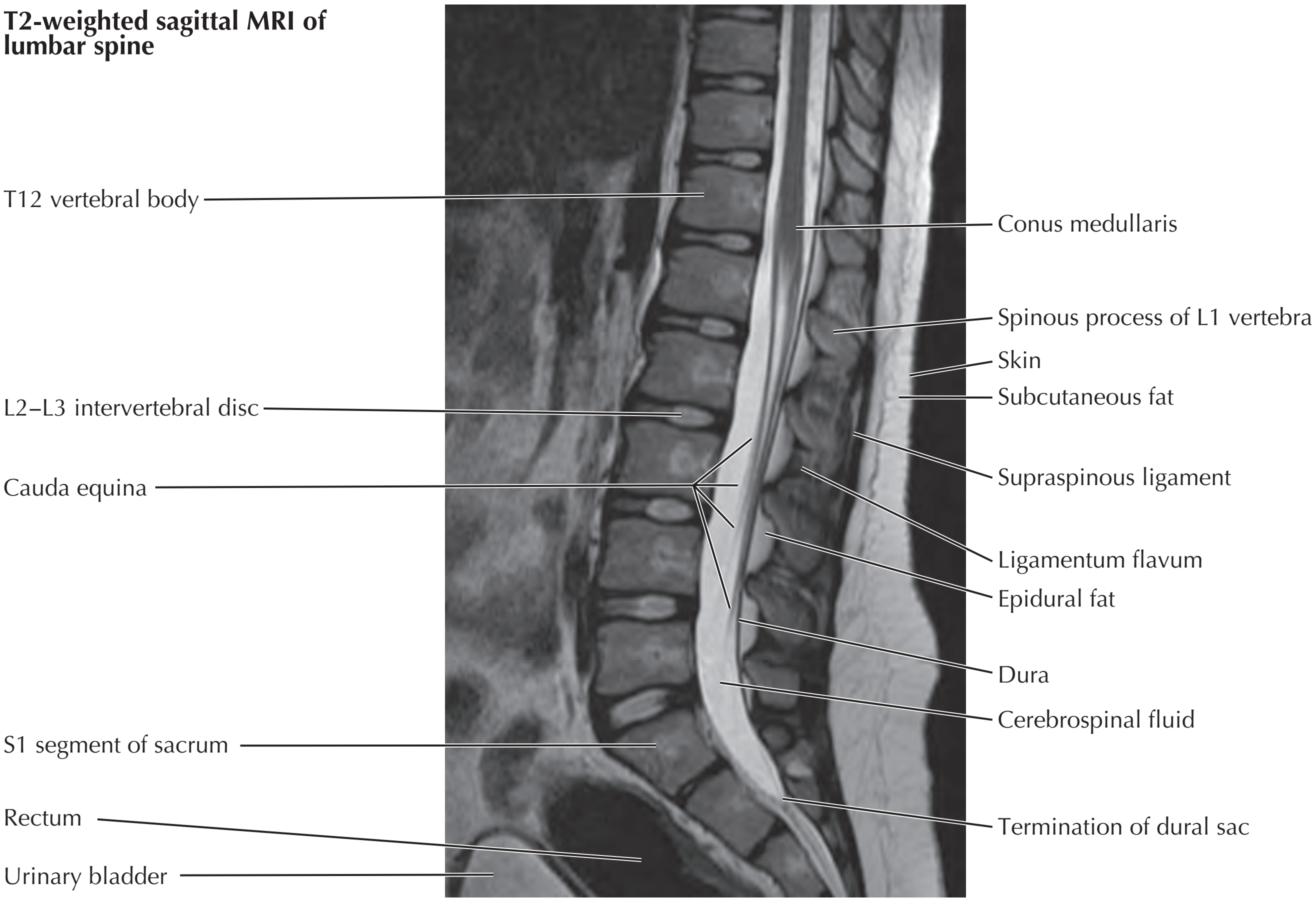

Superior articular process
Pedicle
Mammillary process
Transverse process
Spinous process
Vertebral body
L1
Intervertebral disc
Inferior articular process
Inferior vertebral notch
L2
Intervertebral foramen
Superior vertebral notch
L3
Lamina
L4
L5
Inferior articular facet

Lumbar vertebrae (left lateral view)

Anteroposterior radiograph of thoracolumbar spine

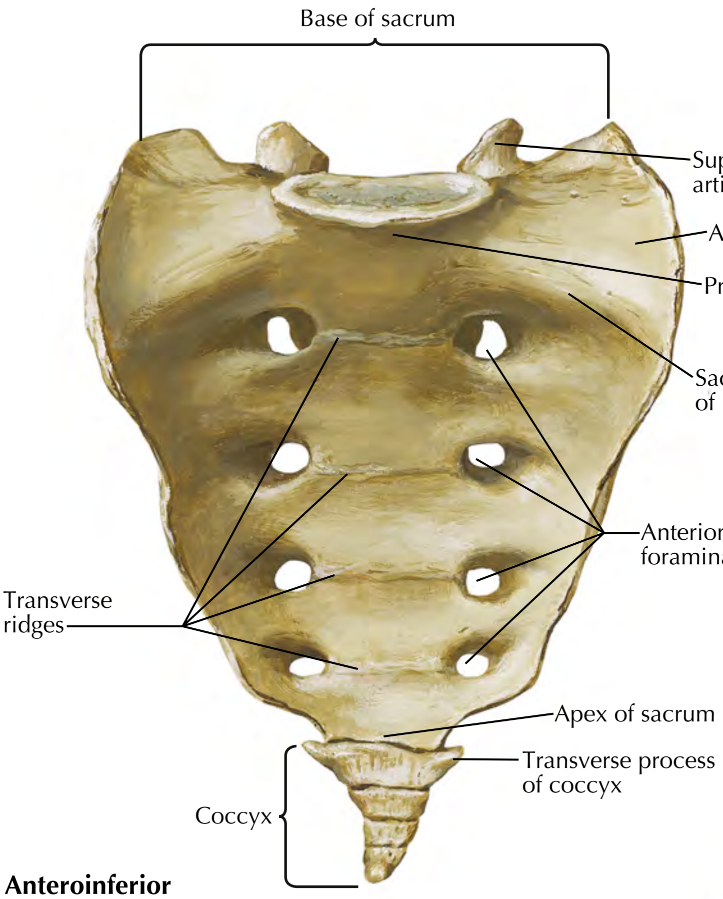

T9 vertebra
12th rib
Transverse process of L1 vertebra
Superior articular process of L2 vertebra
Inferior articular process of L2 vertebra
S2 segment of sacrum
Lamina of L1 vertebra
Spinous process of L2 vertebra
Pedicle of L4 vertebra
Ilium
Sacroiliac joint

T2-weighted sagittal MRI of lumbar spine


T12 vertebral body
L2–L3 intervertebral disc
Cauda equina
S1 segment of sacrum
Rectum
Urinary bladder
Conus medullaris
Spinous process of L1 vertebra
Skin
Subcutaneous fat
Supraspinous ligament
Ligamentum flavum
Epidural fat
Dura
Cerebrospinal fluid
Termination of dural sac

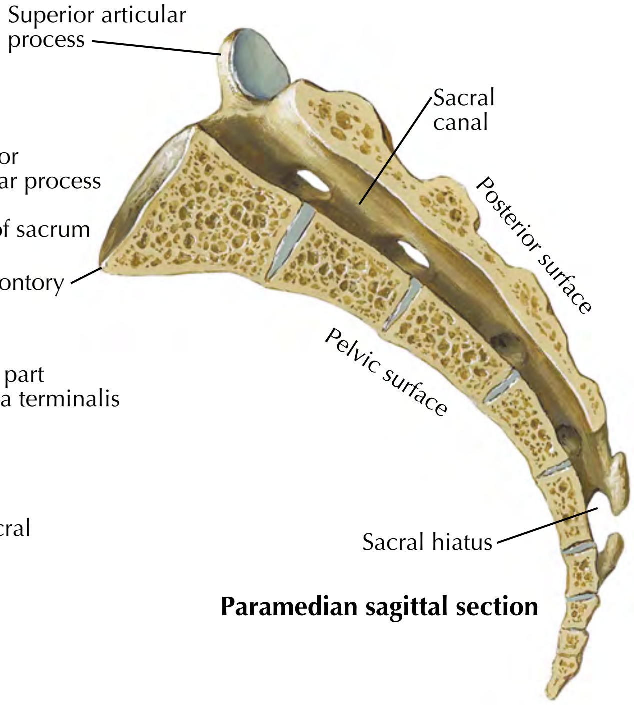
Sacrum and Coccyx

See also **Plates 353, 357, BP 37**

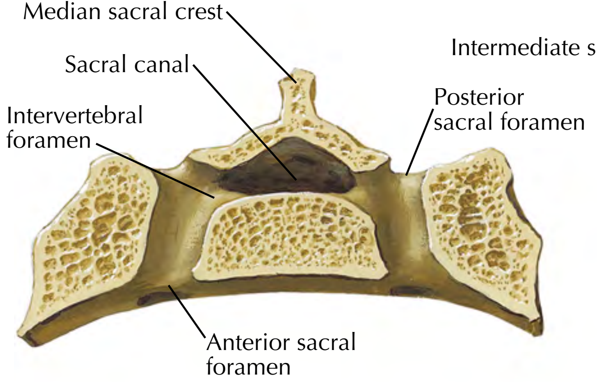

Base of sacrum
Superior articular process
Ala of sacrum
Promontory
Sacral part of linea terminalis
Anterior sacral foramina
Transverse ridges
Apex of sacrum
Transverse process of coccyx
Coccyx

Anteroinferior view

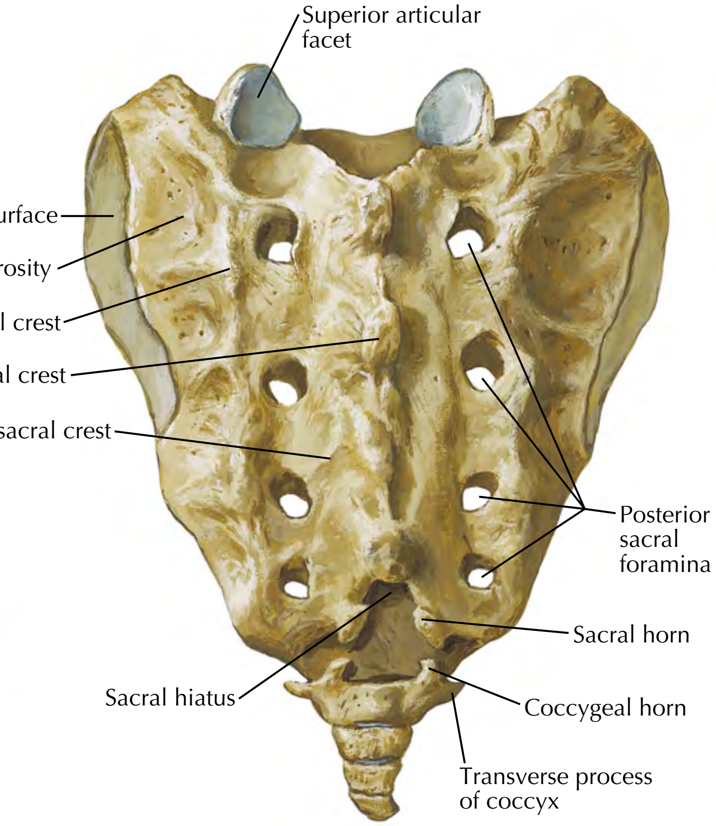
Pelvic surface


Superior articular process
Sacral canal
Posterior surface
Pelvic surface
Sacral hiatus

Paramedian sagittal section


Median sacral crest
Sacral canal
Intervertebral foramen
Posterior sacral foramen
Anterior sacral foramen

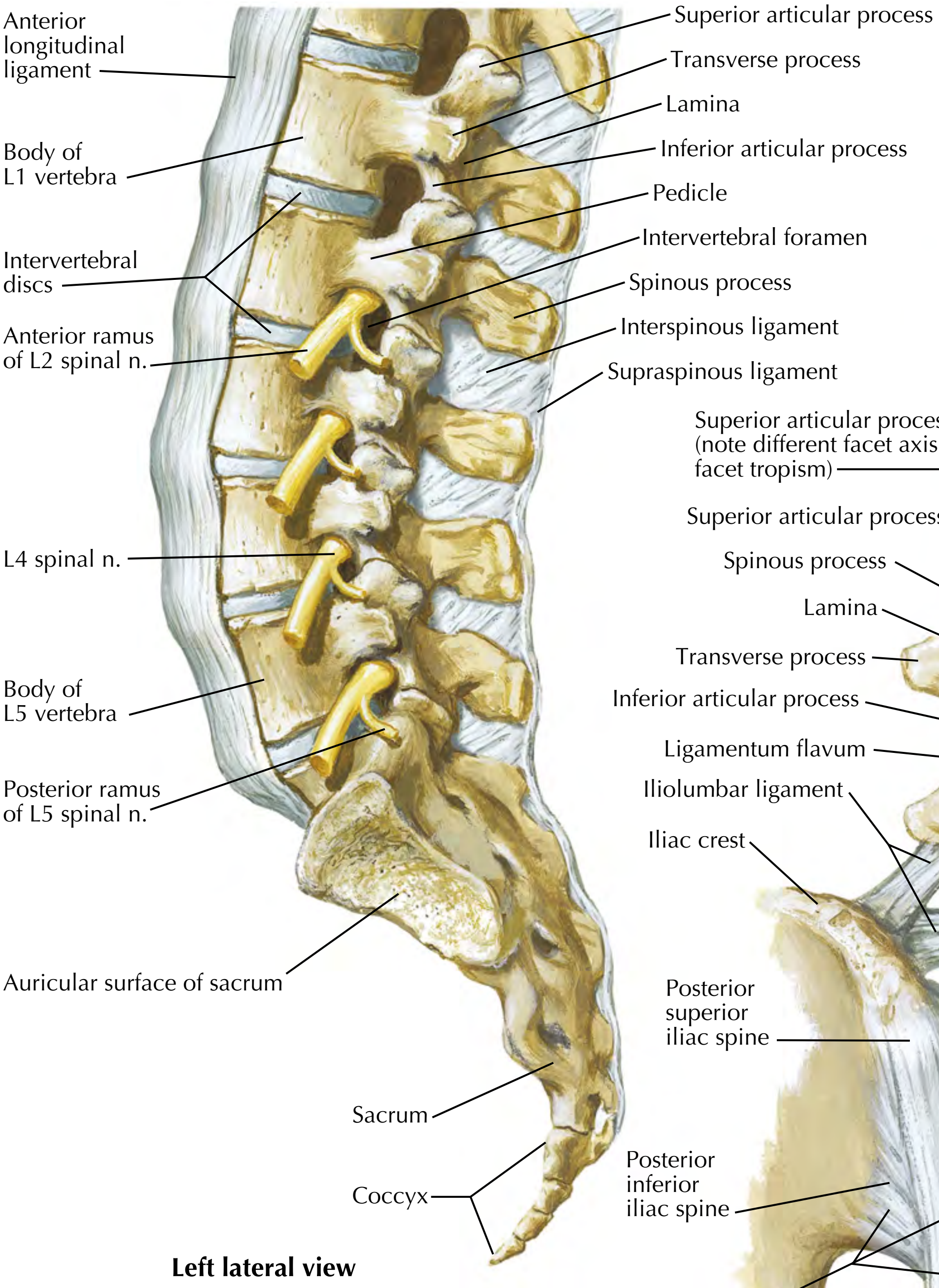
Transverse section through S2 foramina


Superior articular facet
Auricular surface
Sacral tuberosity
Lateral sacral crest
Median sacral crest
Intermediate sacral crest
Posterior sacral foramina
Sacral horn
Sacral hiatus
Coccygeal horn
Transverse process of coccyx

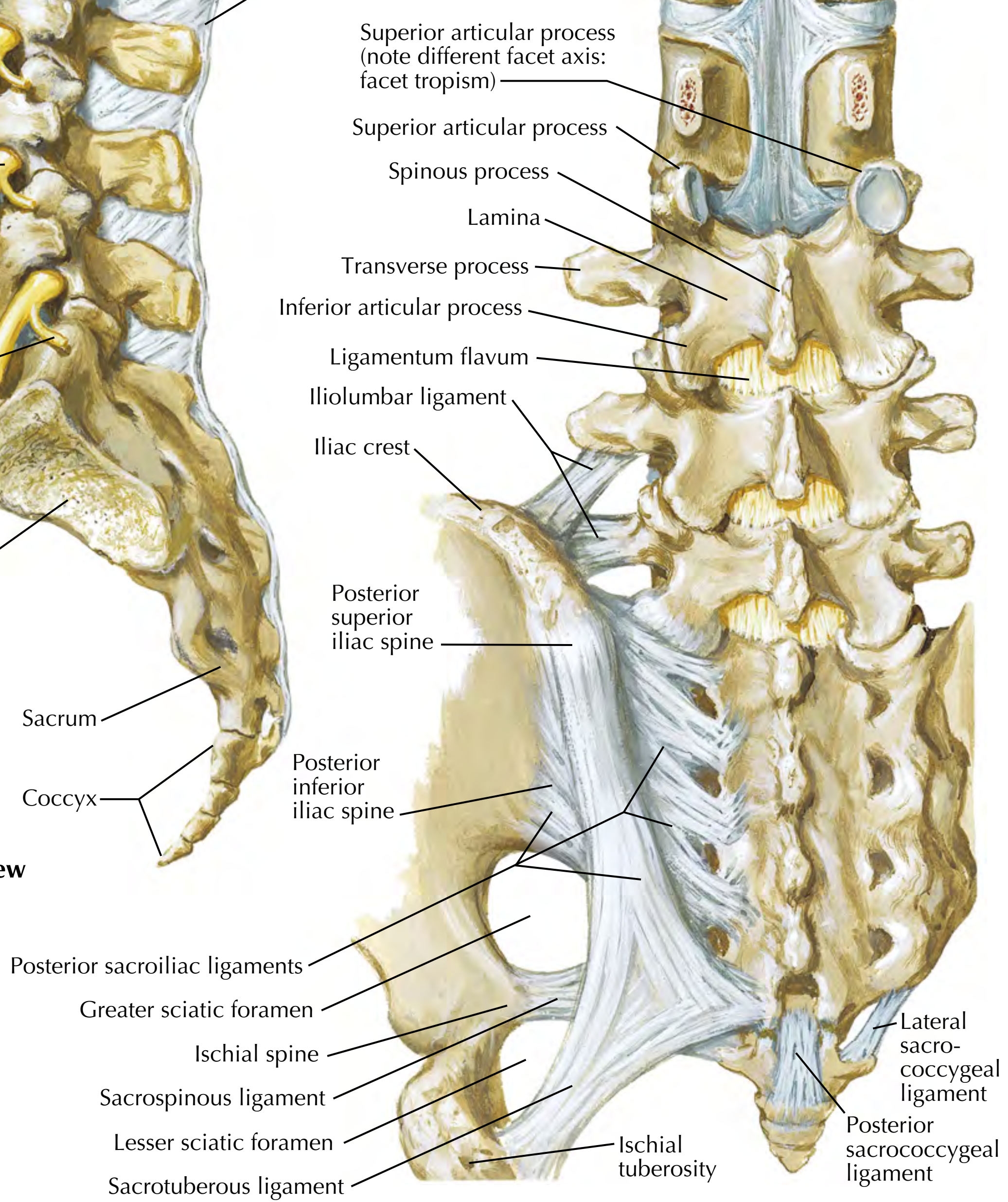
Posterosuperior view

Ligaments of Vertebral Column: Lumbosacral Region

See also **Plate BP 33**


Anterior longitudinal ligament
Body of L1 vertebra
Intervertebral discs
Anterior ramus of L2 spinal n.
L4 spinal n.
Body of L5 vertebra
Posterior ramus of L5 spinal n.
Auricular surface of sacrum
Sacrum
Coccyx
Superior articular process
Transverse process
Lamina
Inferior articular process
Pedicle
Intervertebral foramen
Spinous process
Interspinous ligament
Supraspinous ligament
F. Netter M.D.

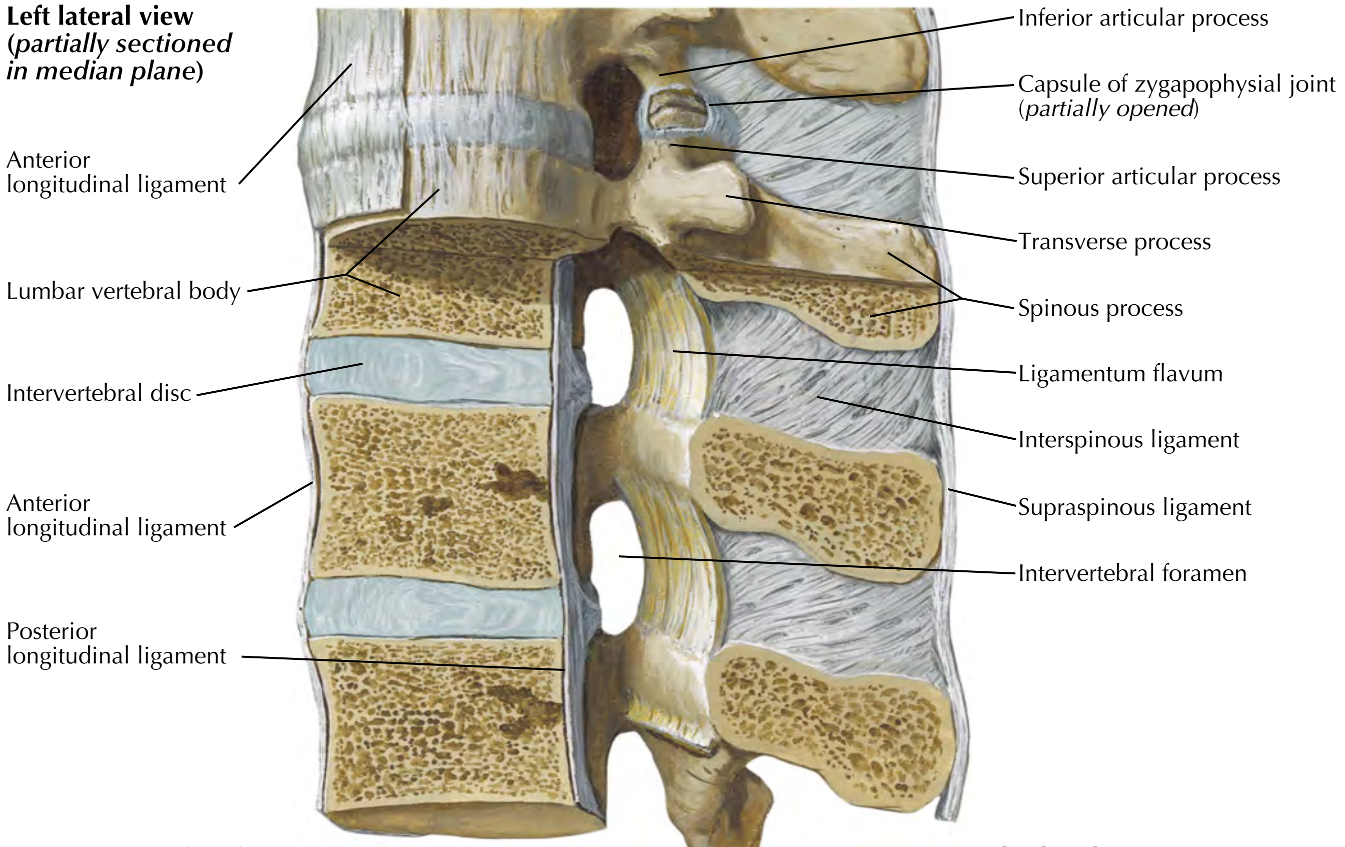
Left lateral view


Pedicle (cut)
Posterior longitudinal ligament
Superior articular process (note different facet axis: facet tropism)
Superior articular process
Spinous process
Lamina
Transverse process
Inferior articular process
Ligamentum flavum
Iliolumbar ligament
Iliac crest
Posterior superior iliac spine
Posterior inferior iliac spine
Posterior sacroiliac ligaments
Greater sciatic foramen
Ischial spine
Sacrospinous ligament
Lesser sciatic foramen
Sacrotuberous ligament
Ischial tuberosity
Lateral sacro-coccygeal ligament
Posterior sacrococcygeal ligament

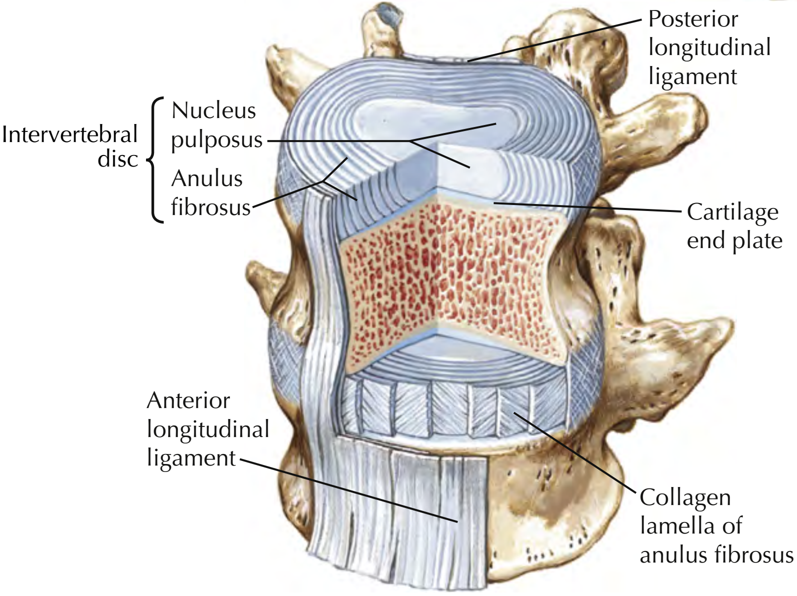
Posterior view

Joints of Vertebral Column: Lumbar Region

Left lateral view
(partially sectioned in median plane)


Anterior longitudinal ligament
Lumbar vertebral body
Intervertebral disc
Anterior longitudinal ligament
Posterior longitudinal ligament
Inferior articular process
Capsule of zygapophysial joint (*partially opened*)
Superior articular process
Transverse process
Spinous process
Ligamentum flavum
Interspinous ligament
Supraspinous ligament
Intervertebral foramen

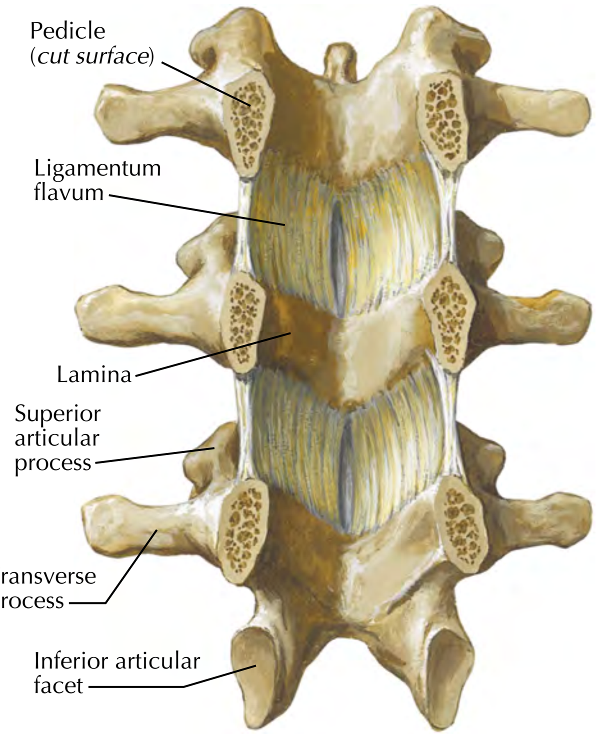
Anterior view


Posterior longitudinal ligament
Intervertebral disc
Nucleus pulposus
Anulus fibrosus
Cartilage end plate
Anterior longitudinal ligament
Collagen lamella of anulus fibrosus

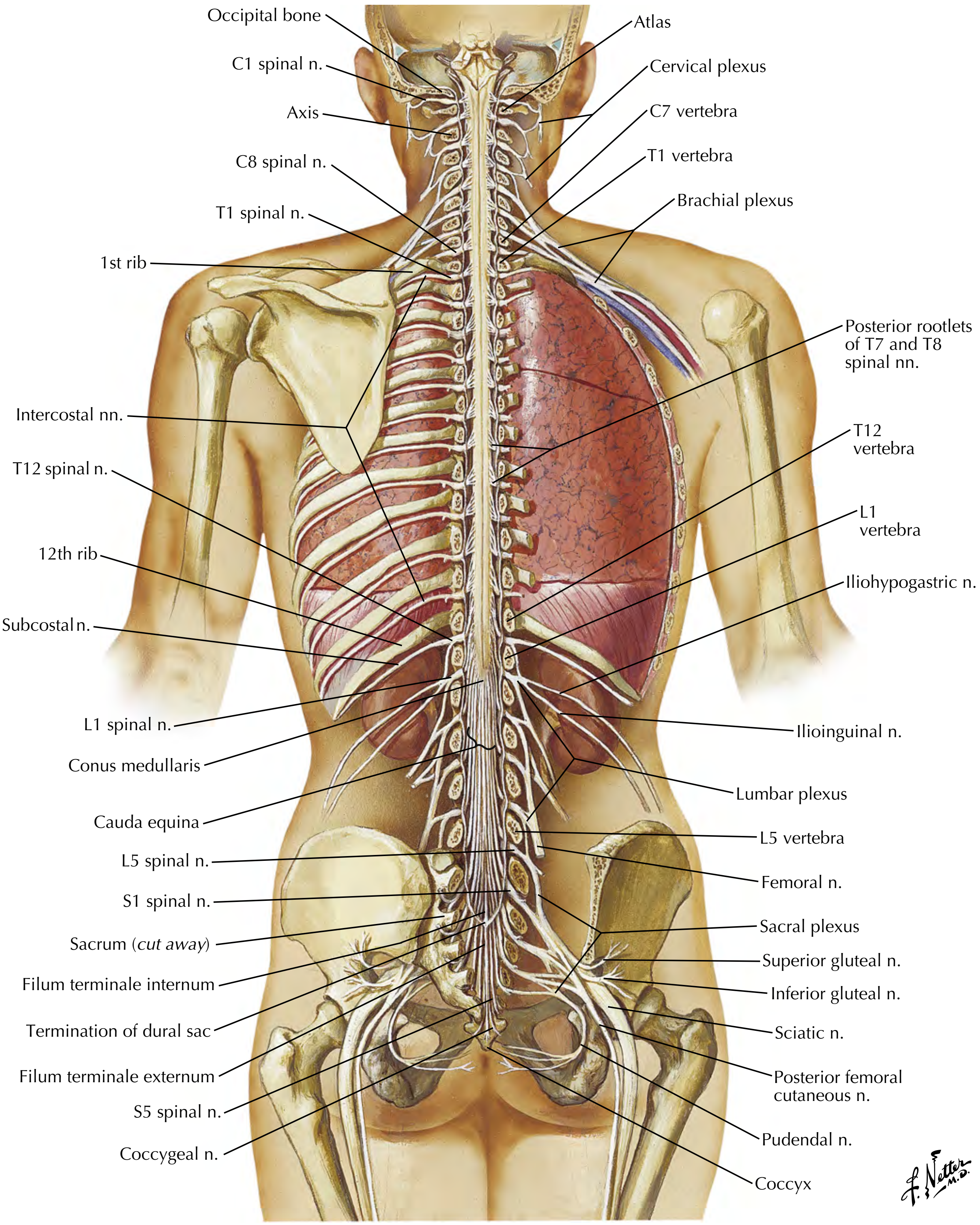
Intervertebral disc composed of central nuclear zone of collagen and hydrated proteoglycans surrounded by concentric lamellae of collagen fibers

F. Netter M.D. C.Machado M.D.

Vertebral arches (anterior view)

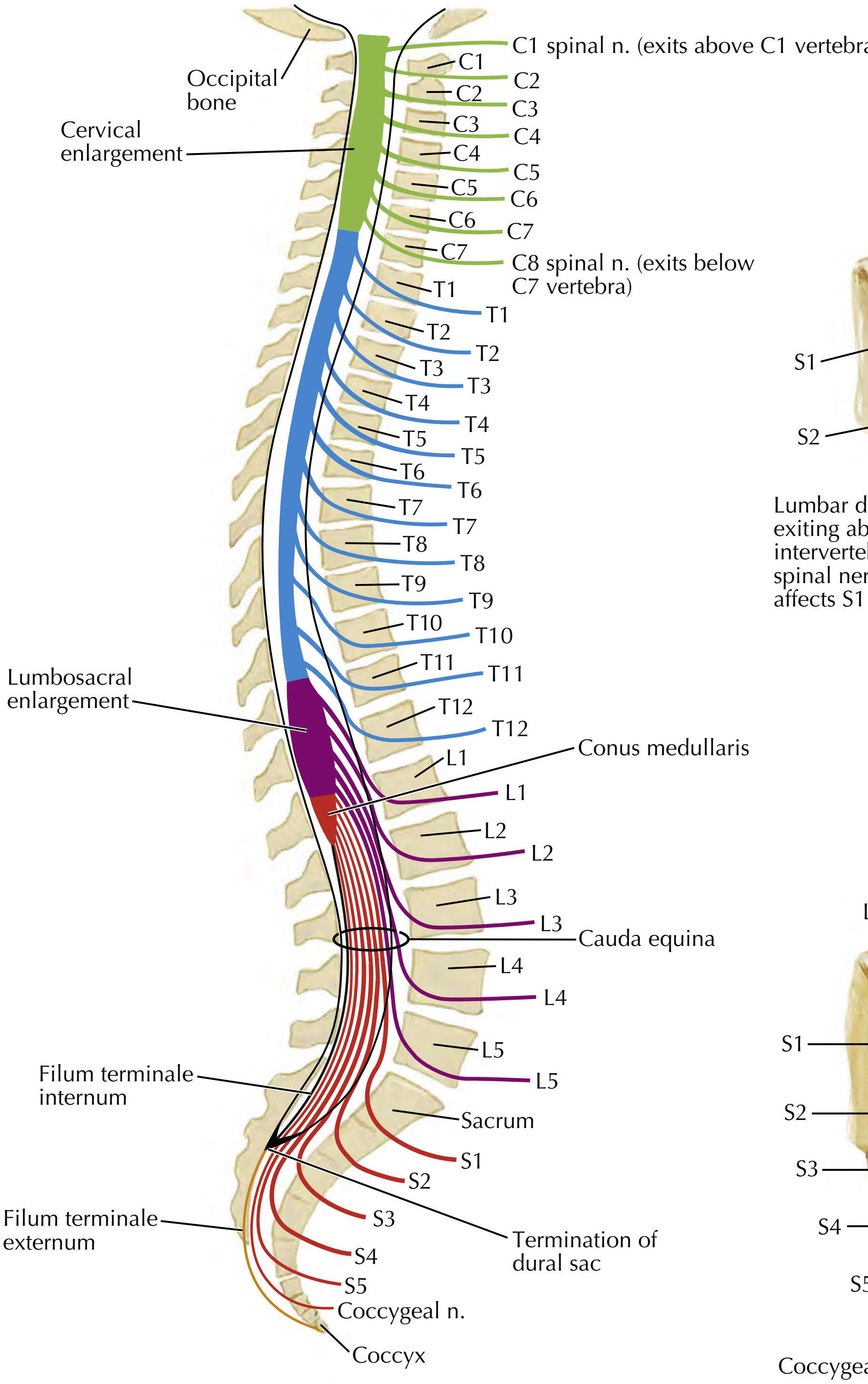

Pedicle (*cut surface*)
Ligamentum flavum
Lamina
Superior articular process
Transverse process
Inferior articular facet

See also **Plates 156, 439, 507, 508**

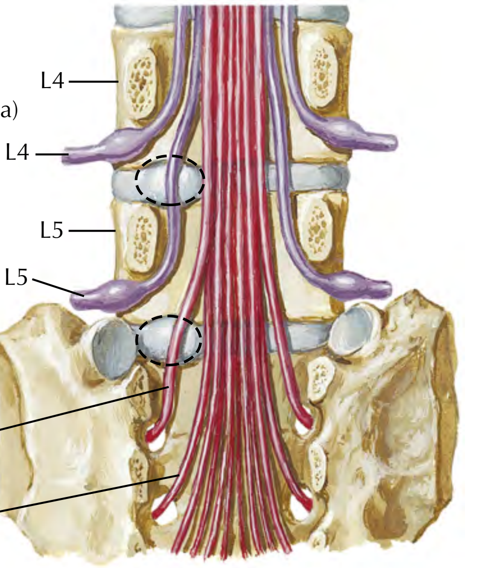

Occipital bone
C1 spinal n.
Axis
C8 spinal n.
T1 spinal n.
1st rib
Intercostal nn.
T12 spinal n.
12th rib
Subcostal n.
L1 spinal n.
Conus medullaris
Cauda equina
L5 spinal n.
S1 spinal n.
Sacrum (*cut away*)
Filum terminale internum
Termination of dural sac
Filum terminale externum
S5 spinal n.
Coccygeal n.
Atlas
Cervical plexus
C7 vertebra
T1 vertebra
Brachial plexus
Posterior rootlets of T7 and T8 spinal nn.
T12 vertebra
L1 vertebra
Iliohypogastric n.
Ilioinguinal n.
Lumbar plexus
L5 vertebra
Femoral n.
Sacral plexus
Superior gluteal n.
Inferior gluteal n.
Sciatic n.
Posterior femoral cutaneous n.
Pudendal n.
Coccyx
F. Netter M.D.

Spinal Nerve Roots and Vertebrae

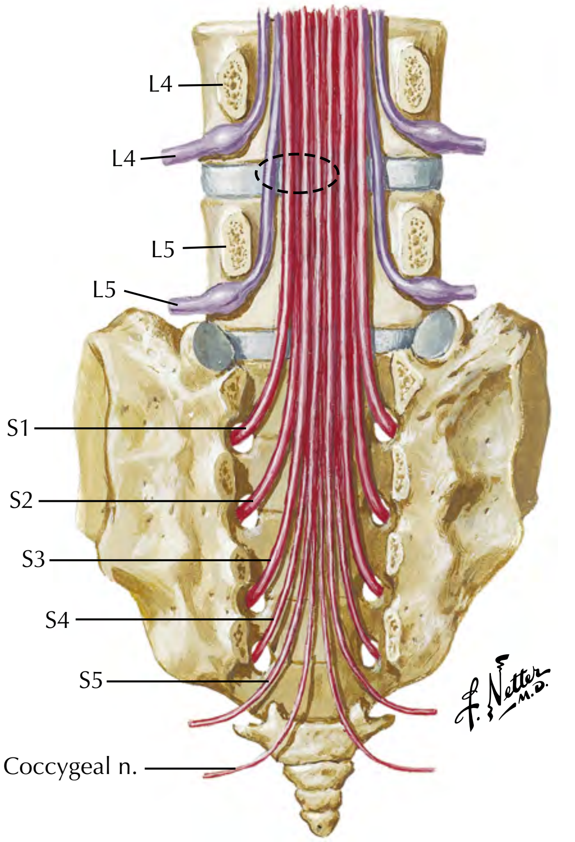
See also **Plate 188**


Occipital bone
Cervical enlargement
C1 spinal n. (exits above C1 vertebra)
C1
C2
C2
C3
C3
C4
C4
C5
C5
C6
C6
C7
C7
C8 spinal n. (exits below C7 vertebra)
T1
T1
T2
T2
T3
T3
T4
T4
T5
T5
T6
T6
T7
T7
T8
T8
T9
T9
T10
T10
T11
T11
T12
T12
Lumbosacral enlargement
Conus medullaris
L1
L1
L2
L2
L3
L3
Cauda equina
L4
L4
L5
L5
Filum terminale internum
Sacrum
S1
S2
S3
Filum terminale externum
Termination of dural sac
S4
S5
Coccygeal n.
Coccyx

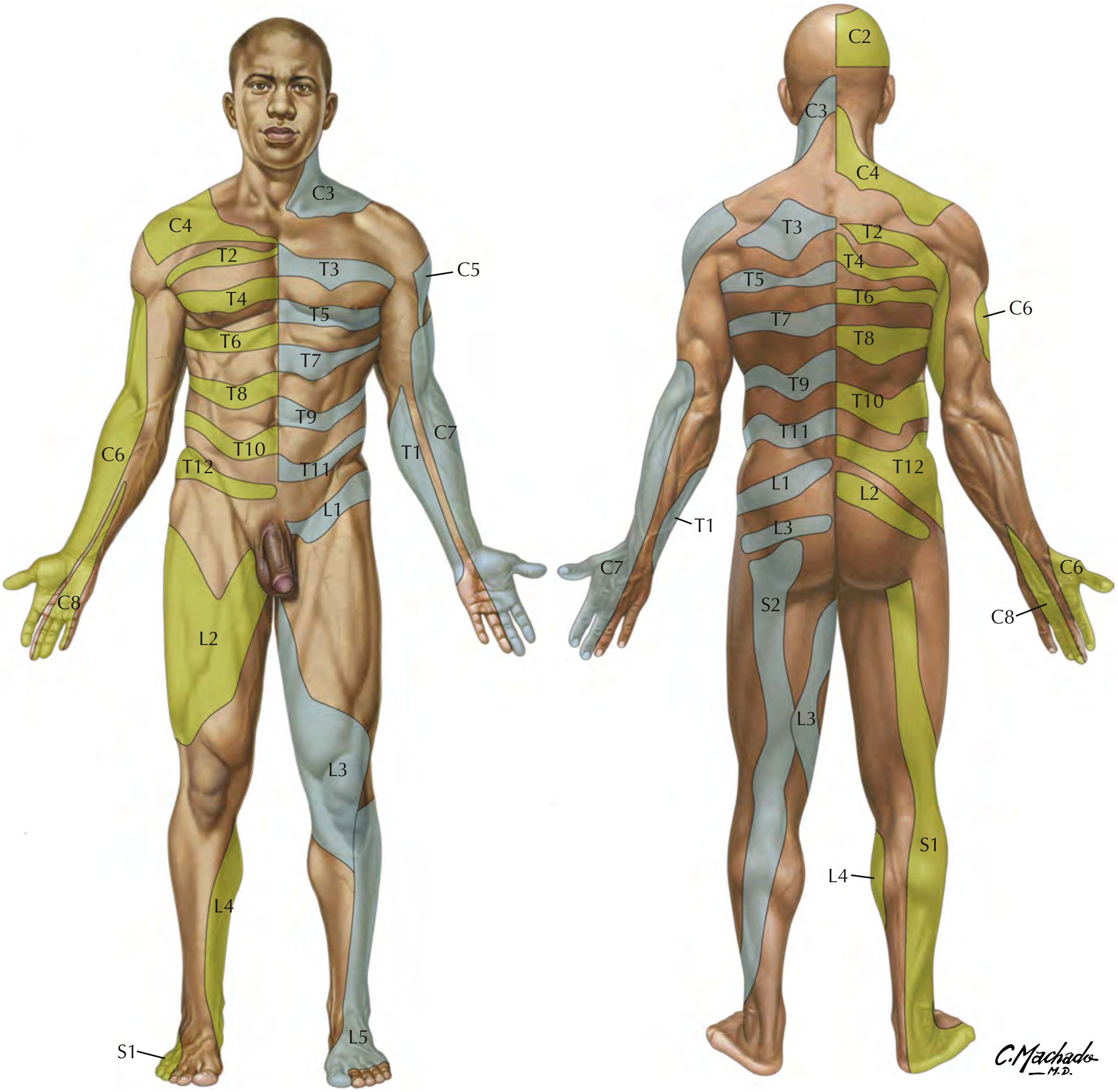
🟩 **Cervical nerves**
🟦 **Thoracic nerves**
🟪 **Lumbar nerves**
🟥 **Sacral and coccygeal nerves**


L4
L4
L5
L5
S1
S2

Lumbar disc protrusion does not usually affect nerve exiting above disc. Lateral protrusion (*dashed oval*) of L4/5 intervertebral disc affects L5 spinal nerve roots, not L4 spinal nerve roots. Protrusion of L5/S1 intervertebral disc affects S1 spinal nerve roots, not L5 spinal nerve roots.


L4
L4
L5
L5
S1
S2
S3
S4
S5
Coccygeal n.

Medial protrusion of L4/5 intervertebral disc (*dashed oval*) rarely affects L4 spinal nerve roots but might affect L5 spinal nerve roots and sometimes S1–4 spinal nerve roots.


C3
C4
T2
T3
C5
T4
T5
T6
T7
T8
T9
C7
C6
T10
T12
T11
T1
L1
C8
L2
L3
L4
S1
L5
C2
C3
C4
T3
T2
T4
T5
T6
C6
T7
T8
T9
T10
T11
T12
L1
L2
T1
L3
C7
C6
S2
C8
L3
S1
L4

Levels of principal dermatomes

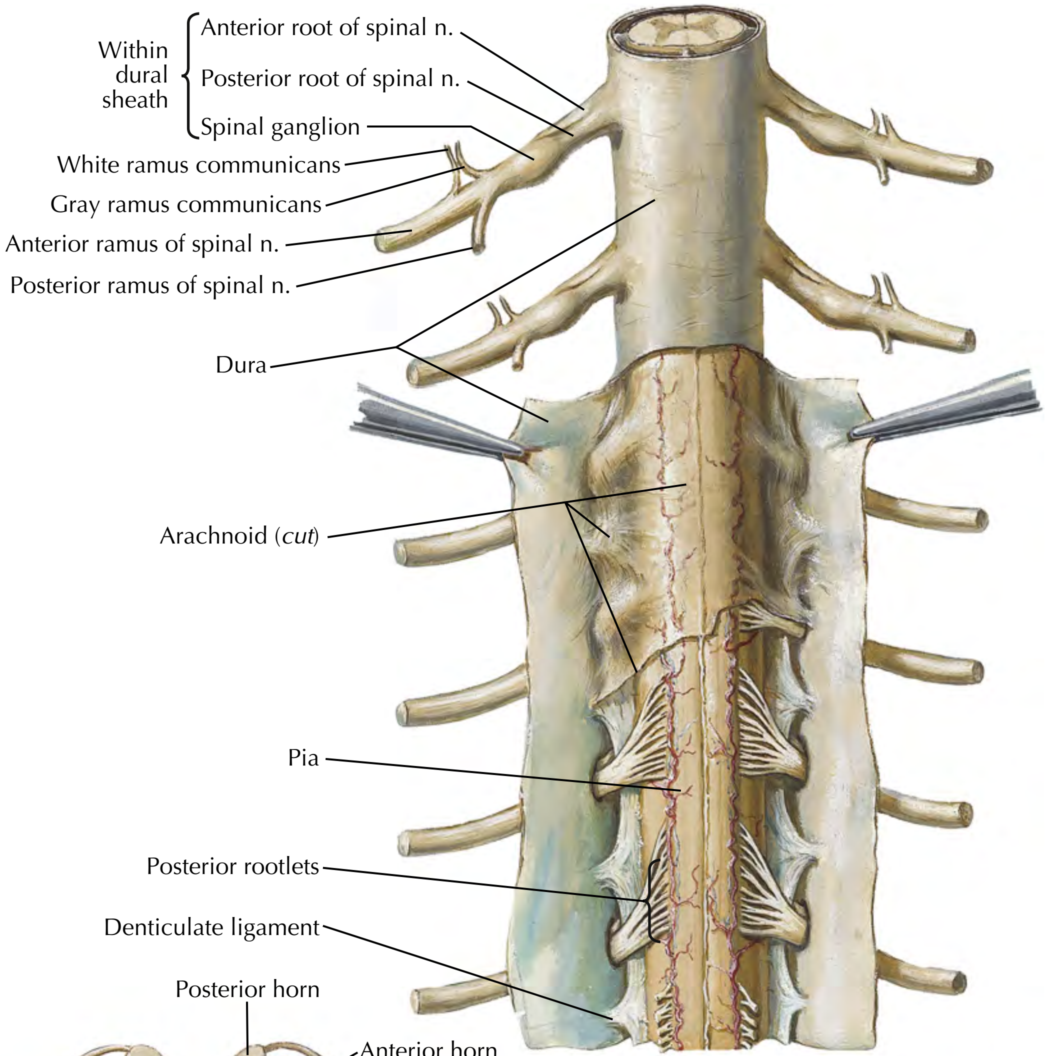
C4	Level of clavicles
C5, C6, C7	Lateral surfaces of upper limbs
C8, T1	Medial surfaces of upper limbs
C6	Lateral digits
C6, C7, C8	Hand
C8	Medial digits
T4	Level of nipples
T10	Level of umbilicus
L1	Inguinal region and proximal anterior thigh
L1, L2, L3, L4	Anteromedial lower limb and gluteal region
L4, L5, S1	Foot
L4	Medial leg
L5, S1	Posterolateral lower limb and dorsum of foot
S1	Lateral foot

Schematic based on Lee MW, McPhee RW, Stringer MD. An evidence-based approach to human dermatomes. Clin Anat. 2008; 21(5):363–373. doi: 10.1002/ca.20636. PMID: 18470936. Please note that these areas are not absolute and vary from person to person. S3, S4, S5, and Co supply the perineum but are not shown for reasons of clarity. Of note, the dermatomes are larger than illustrated as the figure is based on best evidence; gaps represent areas in which the data are inconclusive.

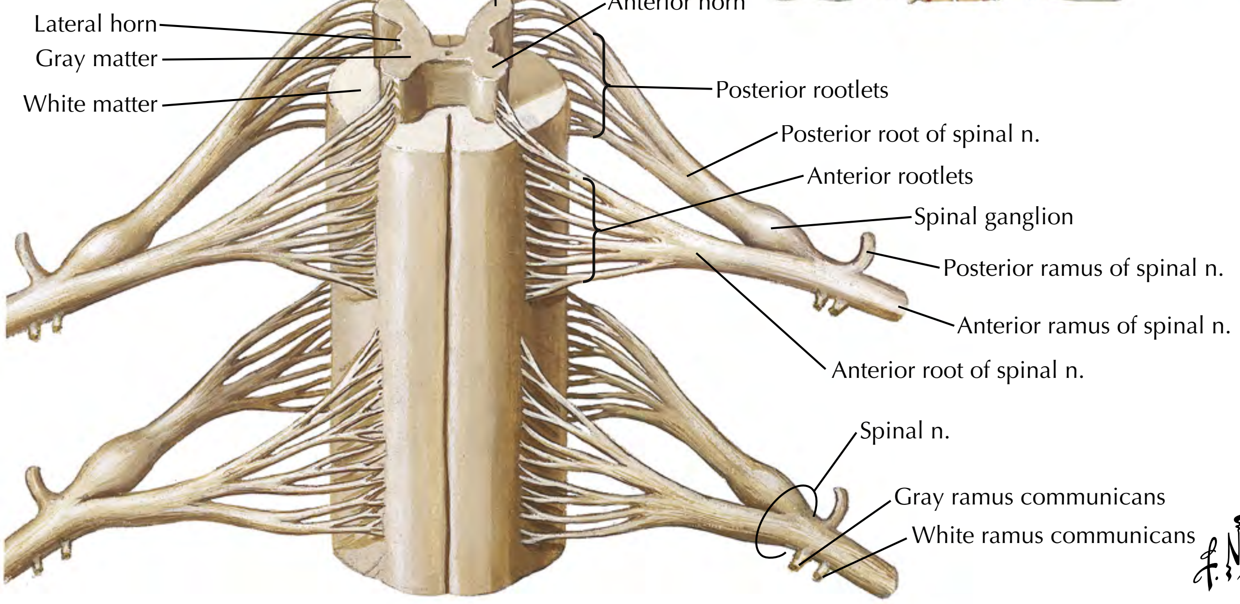
Spinal Meninges and Nerve Roots

See also **Plate BP 40**

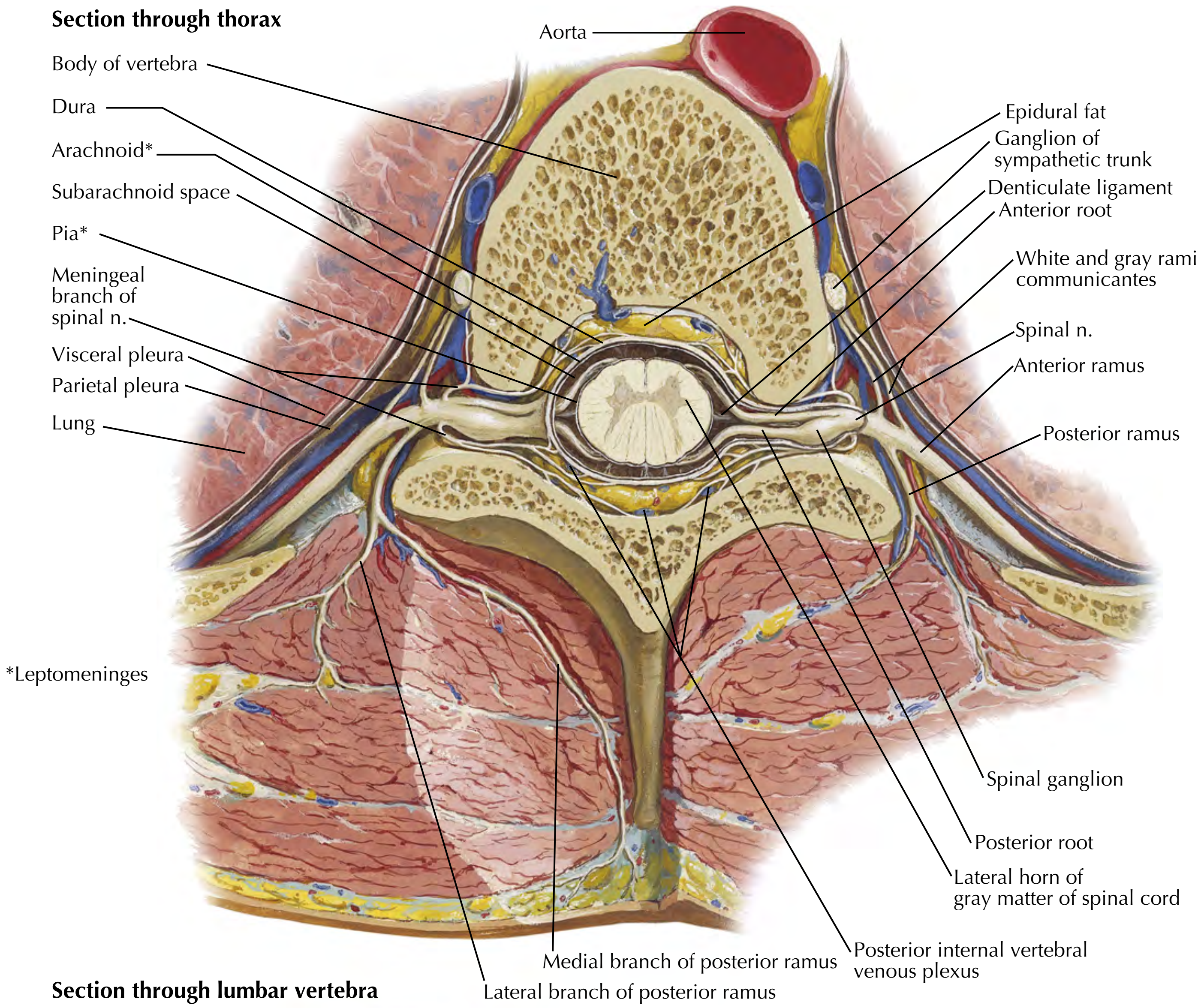
Posterior view


Within dural sheath
Anterior root of spinal n.
Posterior root of spinal n.
Spinal ganglion
White ramus communicans
Gray ramus communicans
Anterior ramus of spinal n.
Posterior ramus of spinal n.
Dura
Arachnoid (*cut*)
Pia
Posterior rootlets
Denticulate ligament

Dura and arachnoid removed: anterior view (*greatly magnified*)

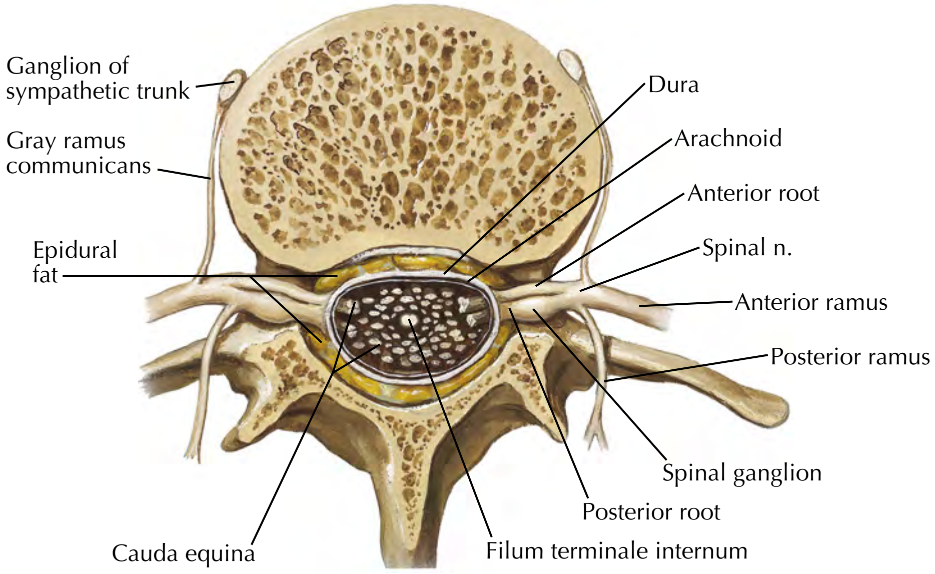

Posterior horn
Anterior horn
Lateral horn
Gray matter
White matter
Posterior rootlets
Posterior root of spinal n.
Anterior rootlets
Spinal ganglion
Posterior ramus of spinal n.
Anterior ramus of spinal n.
Anterior root of spinal n.
Spinal n.
Gray ramus communicans
White ramus communicans

Section through thorax


Body of vertebra
Dura
Arachnoid*
Subarachnoid space
Pia*
Meningeal branch of spinal n.
Visceral pleura
Parietal pleura
Lung
Aorta
Epidural fat
Ganglion of sympathetic trunk
Denticulate ligament
Anterior root
White and gray rami communicantes
Spinal n.
Anterior ramus
Posterior ramus
Spinal ganglion
Posterior root
Lateral horn of gray matter of spinal cord
Posterior internal vertebral venous plexus
Medial branch of posterior ramus
Lateral branch of posterior ramus

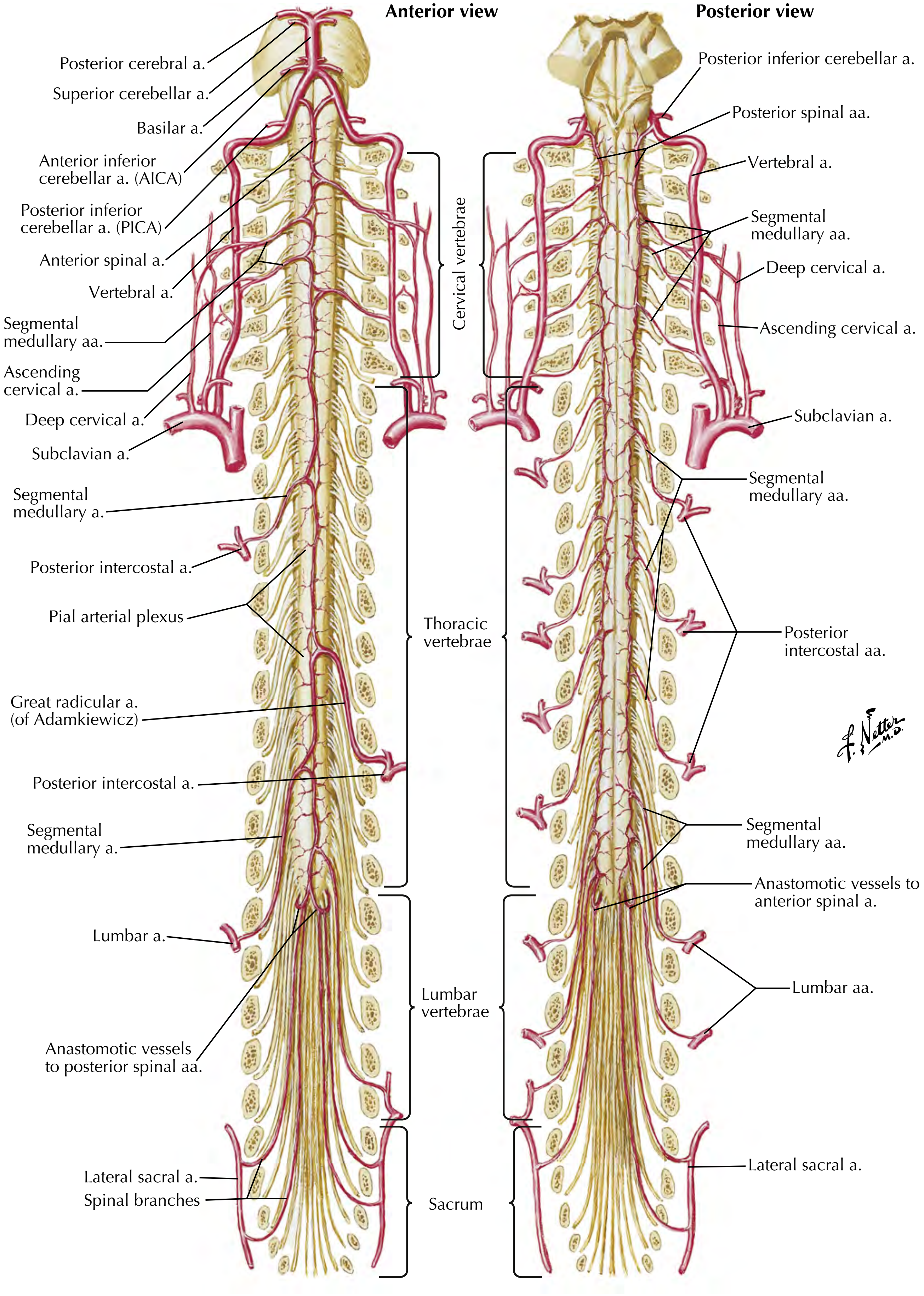
*Leptomeninges

Section through lumbar vertebra

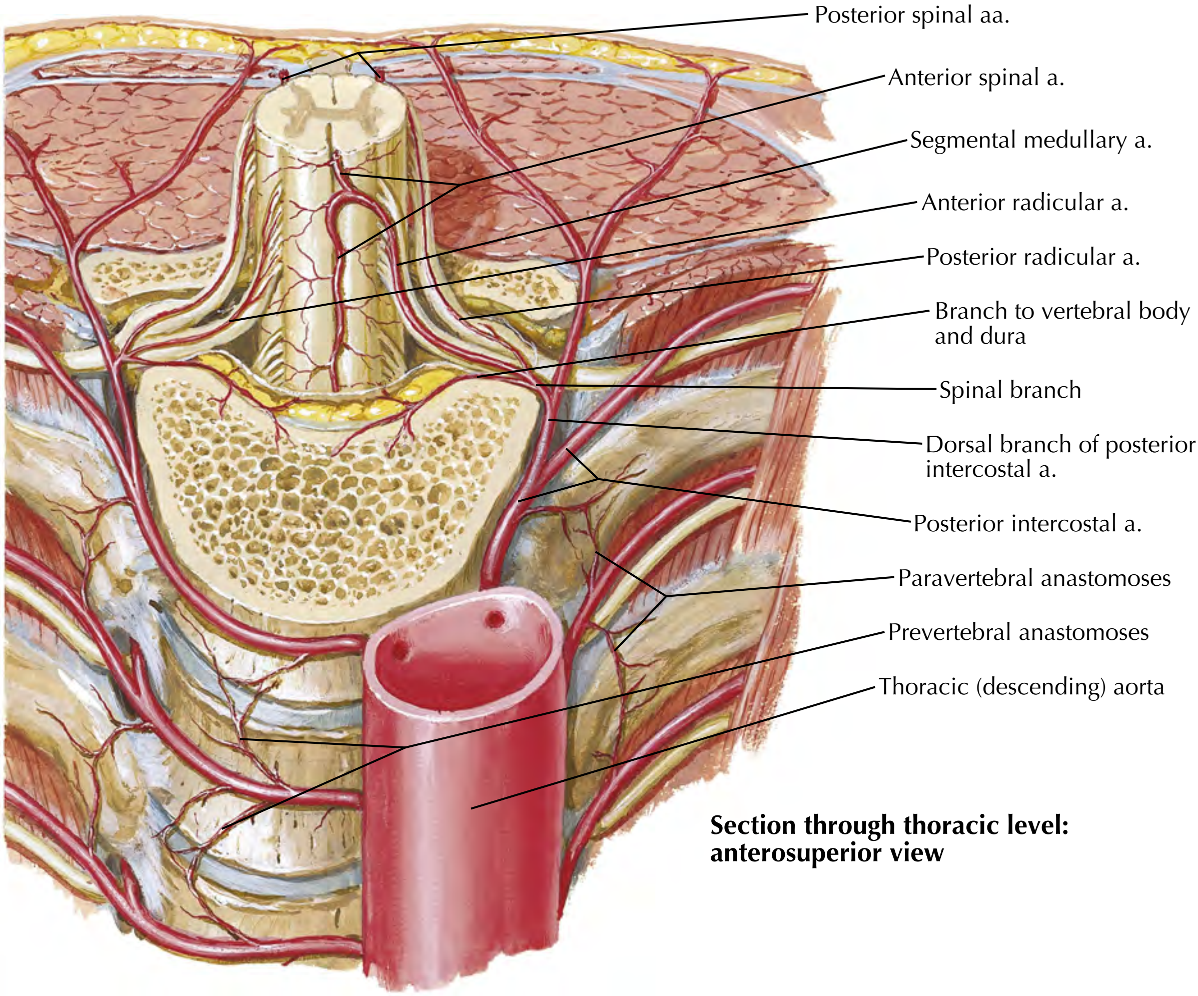

Ganglion of sympathetic trunk
Gray ramus communicans
Epidural fat
Cauda equina
Dura
Arachnoid
Anterior root
Spinal n.
Anterior ramus
Posterior ramus
Spinal ganglion
Posterior root
Filum terminale internum

F. Netter M.D.

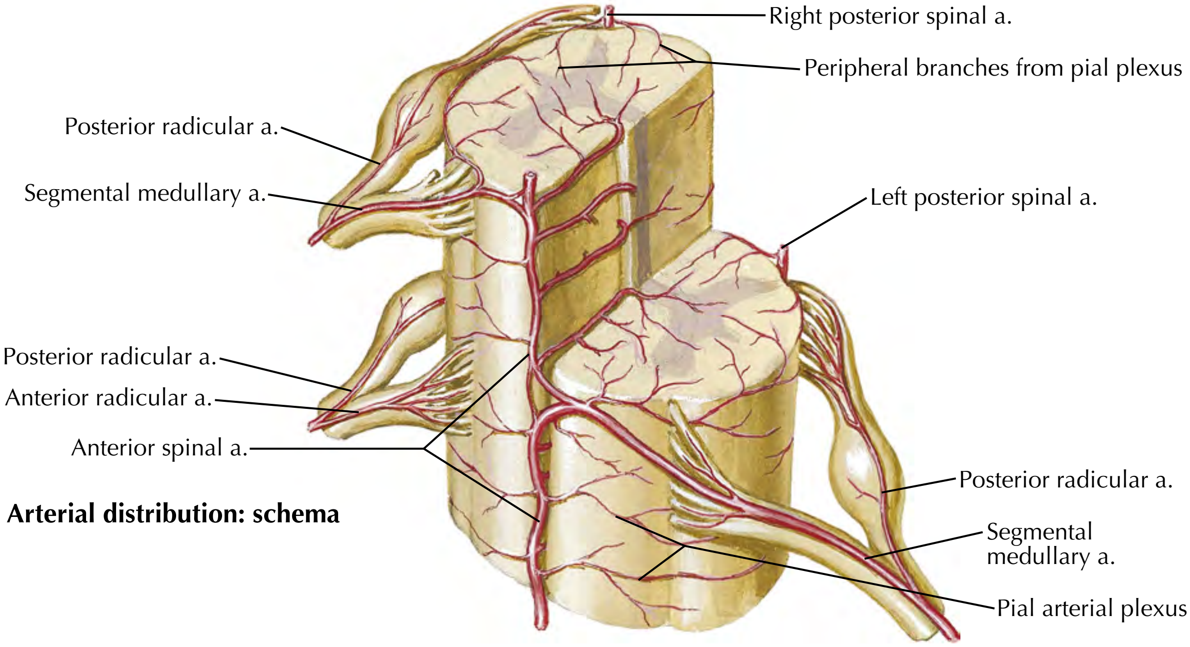
Arteries of Spinal Cord: Schema


Anterior view
Posterior cerebral a.
Superior cerebellar a.
Basilar a.
Anterior inferior cerebellar a. (AICA)
Posterior inferior cerebellar a. (PICA)
Anterior spinal a.
Vertebral a.
Segmental medullary aa.
Ascending cervical a.
Deep cervical a.
Subclavian a.
Segmental medullary a.
Posterior intercostal a.
Pial arterial plexus
Great radicular a. (of Adamkiewicz)
Posterior intercostal a.
Segmental medullary a.
Lumbar a.
Anastomotic vessels to posterior spinal aa.
Lateral sacral a.
Spinal branches
Cervical vertebrae
Thoracic vertebrae
Lumbar vertebrae
Sacrum
Posterior view
Posterior inferior cerebellar a.
Posterior spinal aa.
Vertebral a.
Segmental medullary aa.
Deep cervical a.
Ascending cervical a.
Subclavian a.
Segmental medullary aa.
Posterior intercostal aa.
Segmental medullary aa.
Anastomotic vessels to anterior spinal a.
Lumbar aa.
Lateral sacral a.

Note: All spinal nerve roots have associated radicular or segmental medullary arteries. Most roots have radicular arteries (see Plate 192). Both types of arteries run along roots, but radicular arteries end before reaching anterior or posterior spinal arteries; larger segmental medullary arteries continue on to supply a segment of these arteries.


Posterior spinal aa.
Anterior spinal a.
Segmental medullary a.
Anterior radicular a.
Posterior radicular a.
Branch to vertebral body and dura
Spinal branch
Dorsal branch of posterior intercostal a.
Posterior intercostal a.
Paravertebral anastomoses
Prevertebral anastomoses
Thoracic (descending) aorta

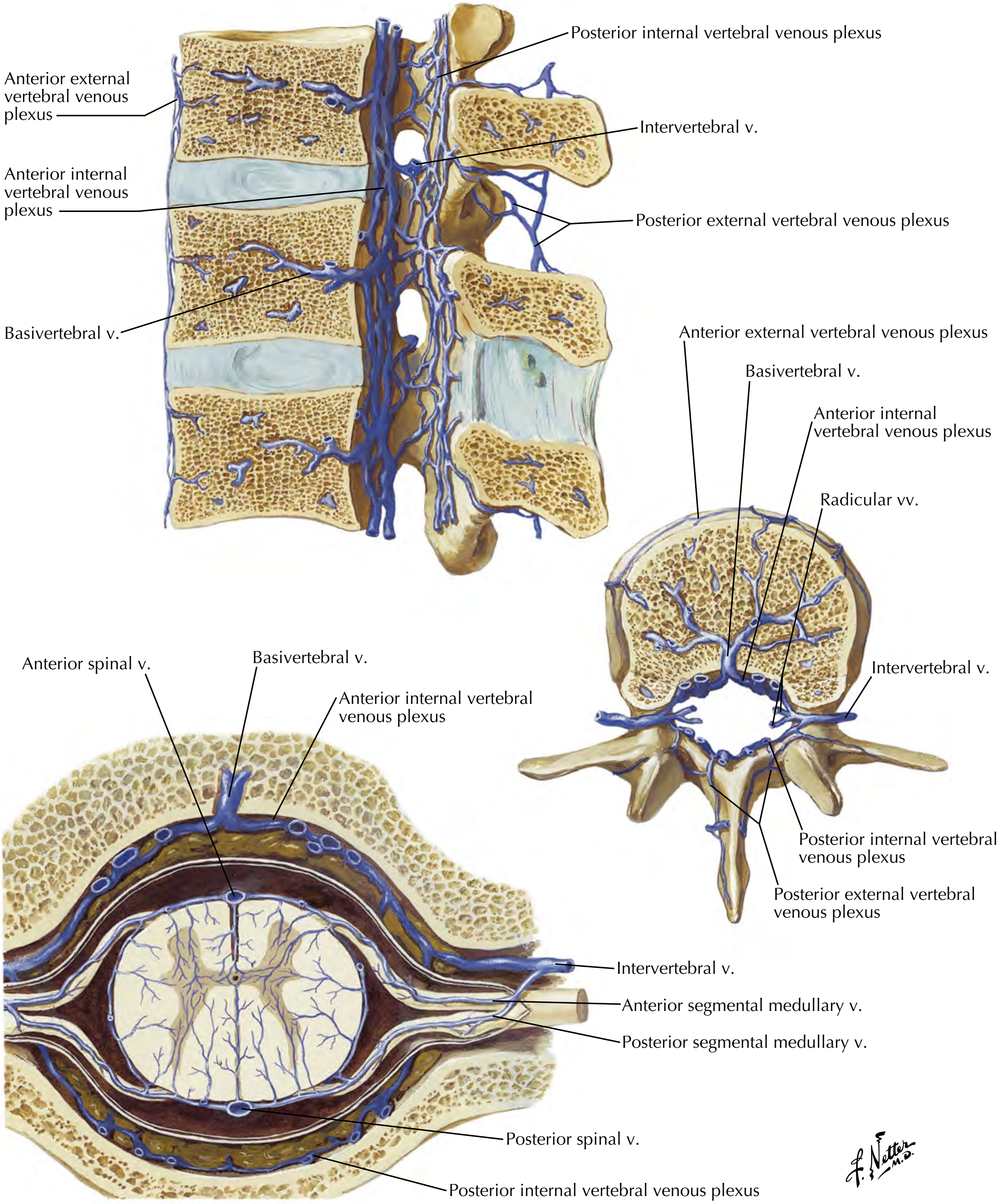
Section through thoracic level: anterosuperior view


Right posterior spinal a.
Peripheral branches from pial plexus
Posterior radicular a.
Segmental medullary a.
Left posterior spinal a.
Posterior radicular a.
Anterior radicular a.
Anterior spinal a.
Posterior radicular a.
Segmental medullary a.
Pial arterial plexus

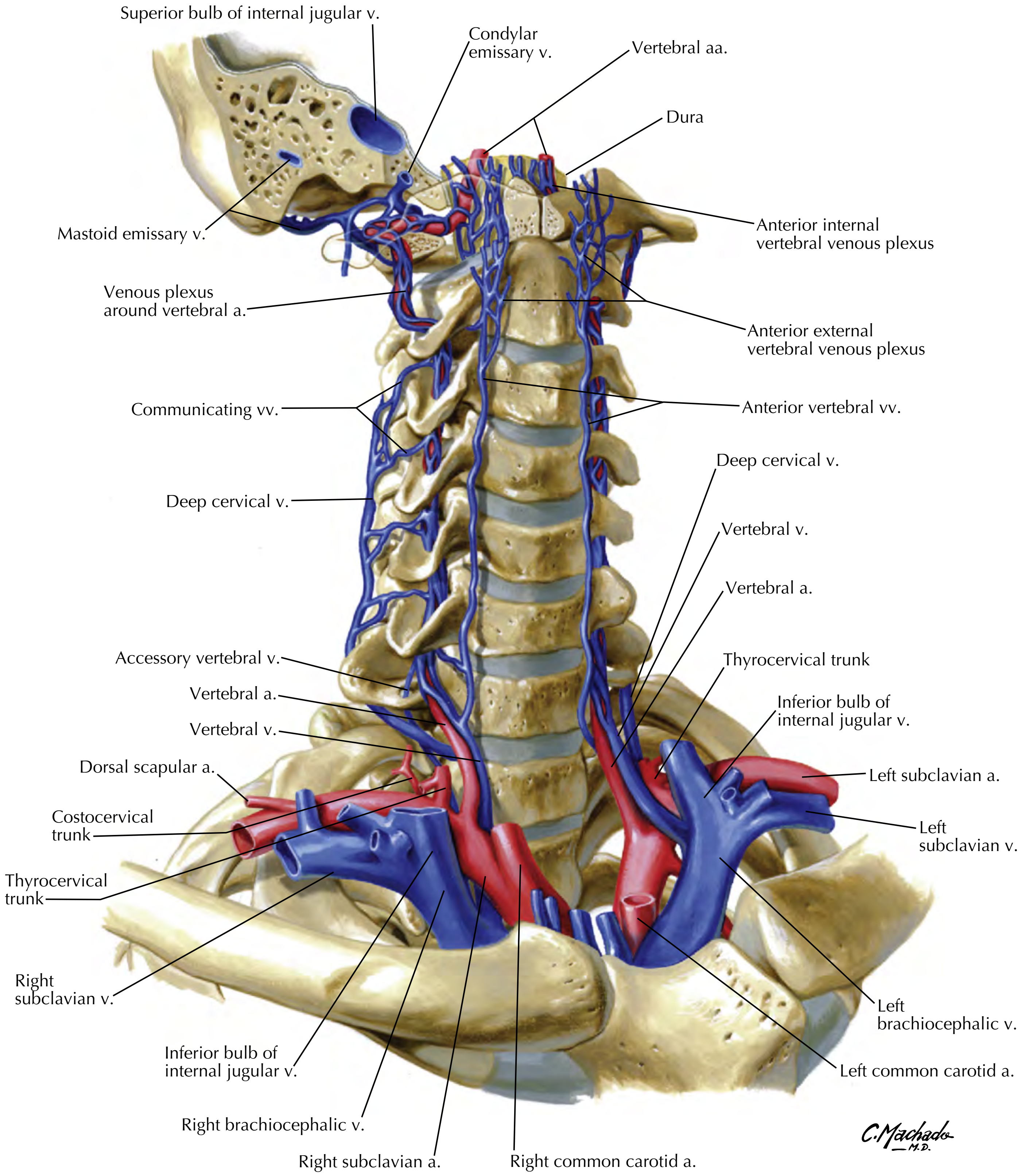
Arterial distribution: schema

Veins of Spinal Cord and Vertebral Column

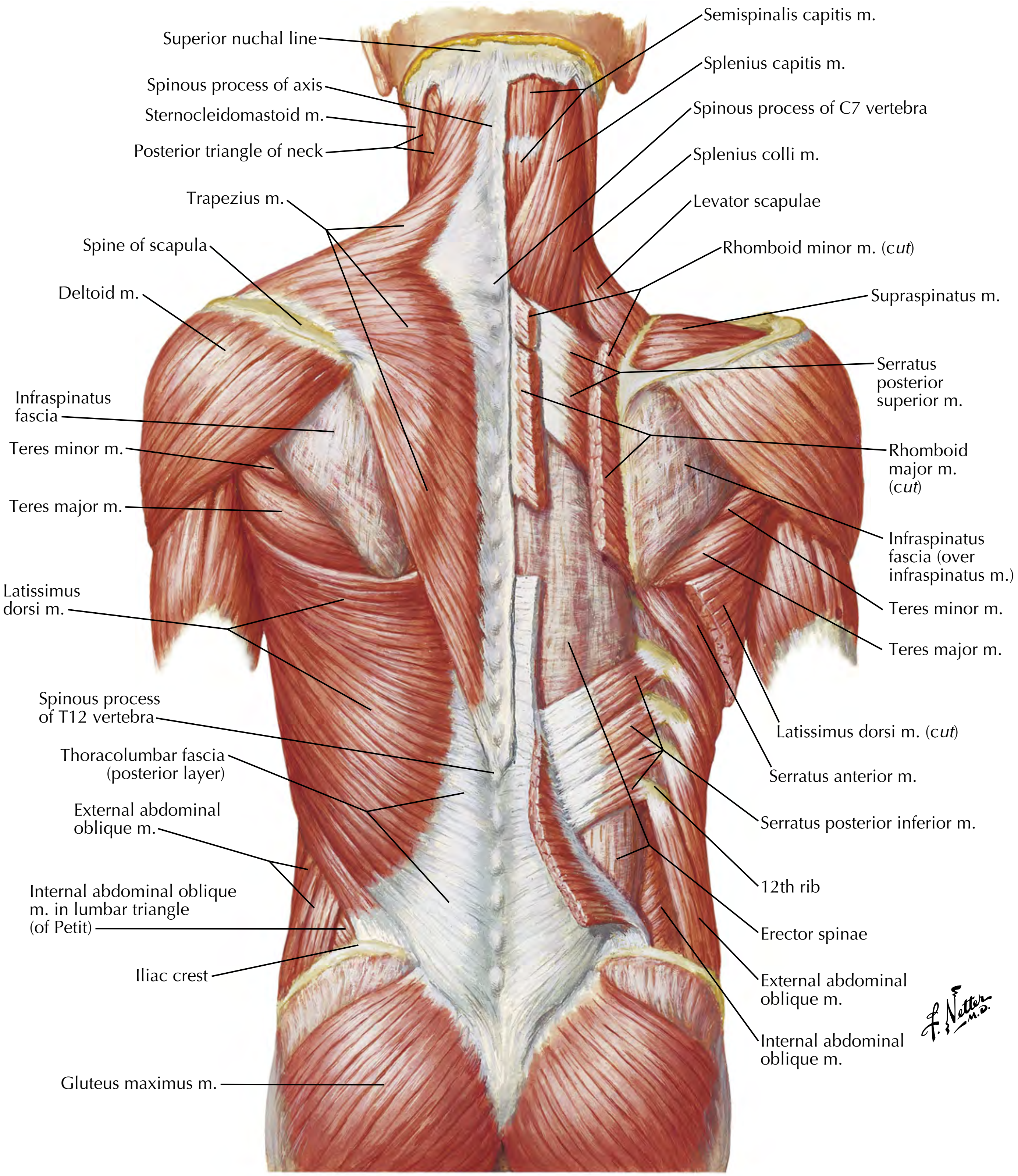
See also **Plate BP 39**


Posterior internal vertebral venous plexus
Anterior external vertebral venous plexus
Intervertebral v.
Anterior internal vertebral venous plexus
Posterior external vertebral venous plexus
Basivertebral v.
Anterior external vertebral venous plexus
Basivertebral v.
Anterior internal vertebral venous plexus
Radicular vv.
Intervertebral v.
Posterior internal vertebral venous plexus
Posterior external vertebral venous plexus
Anterior spinal v.
Basivertebral v.
Anterior internal vertebral venous plexus
Intervertebral v.
Anterior segmental medullary v.
Posterior segmental medullary v.
Posterior spinal v.
Posterior internal vertebral venous plexus
F. Netter M.D.

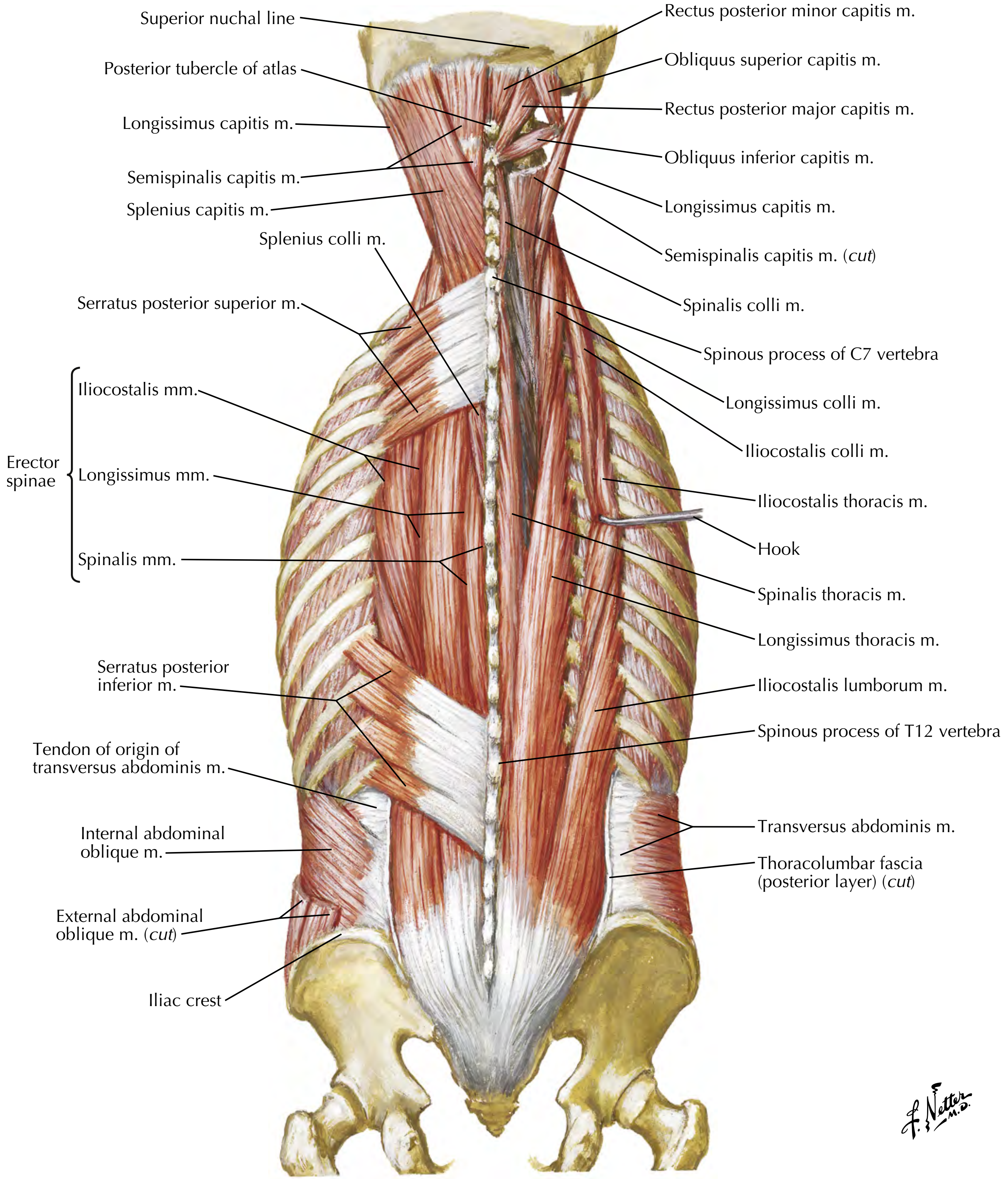
See also **Plate BP 39**


Superior bulb of internal jugular v.
Condylar emissary v.
Vertebral aa.
Dura
Mastoid emissary v.
Anterior internal vertebral venous plexus
Venous plexus around vertebral a.
Anterior external vertebral venous plexus
Communicating vv.
Anterior vertebral vv.
Deep cervical v.
Deep cervical v.
Vertebral v.
Vertebral a.
Thyrocervical trunk
Accessory vertebral v.
Vertebral a.
Inferior bulb of internal jugular v.
Vertebral v.
Dorsal scapular a.
Left subclavian a.
Costocervical trunk
Left subclavian v.
Thyrocervical trunk
Right subclavian v.
Left brachiocephalic v.
Inferior bulb of internal jugular v.
Left common carotid a.
Right brachiocephalic v.
Right subclavian a.
Right common carotid a.
C. Machado M.D.

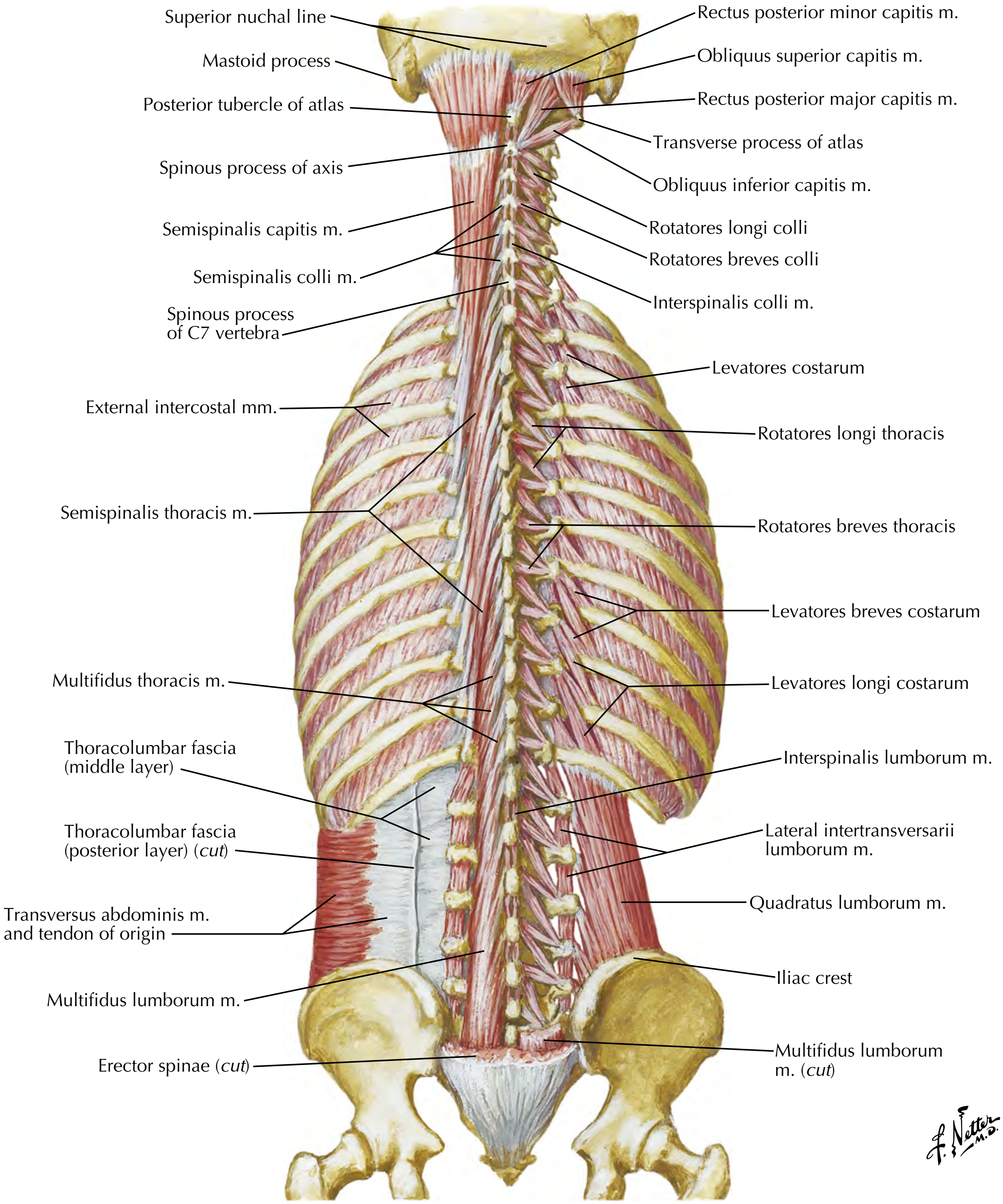
See also **Plates 54, 200, 275**


Superior nuchal line
Spinous process of axis
Sternocleidomastoid m.
Posterior triangle of neck
Trapezius m.
Spine of scapula
Deltoid m.
Infraspinatus fascia
Teres minor m.
Teres major m.
Latissimus dorsi m.
Spinous process of T12 vertebra
Thoracolumbar fascia (posterior layer)
External abdominal oblique m.
Internal abdominal oblique m. in lumbar triangle (of Petit)
Iliac crest
Gluteus maximus m.
Semispinalis capitis m.
Splenius capitis m.
Spinous process of C7 vertebra
Splenius colli m.
Levator scapulae
Rhomboid minor m. (*cut*)
Supraspinatus m.
Serratus posterior superior m.
Rhomboid major m. (*cut*)
Infraspinatus fascia (over infraspinatus m.)
Teres minor m.
Teres major m.
Latissimus dorsi m. (*cut*)
Serratus anterior m.
Serratus posterior inferior m.
12th rib
Erector spinae
External abdominal oblique m.
Internal abdominal oblique m.

See also **Plate 200**


Superior nuchal line
Posterior tubercle of atlas
Longissimus capitis m.
Semispinalis capitis m.
Splenius capitis m.
Splenius colli m.
Serratus posterior superior m.
Erector spinae
Iliocostalis mm.
Longissimus mm.
Spinalis mm.
Serratus posterior inferior m.
Tendon of origin of transversus abdominis m.
Internal abdominal oblique m.
External abdominal oblique m. (*cut*)
Iliac crest
Rectus posterior minor capitis m.
Obliquus superior capitis m.
Rectus posterior major capitis m.
Obliquus inferior capitis m.
Longissimus capitis m.
Semispinalis capitis m. (*cut*)
Spinalis colli m.
Spinous process of C7 vertebra
Longissimus colli m.
Iliocostalis colli m.
Iliocostalis thoracis m.
Hook
Spinalis thoracis m.
Longissimus thoracis m.
Iliocostalis lumborum m.
Spinous process of T12 vertebra
Transversus abdominis m.
Thoracolumbar fascia (posterior layer) (*cut*)

See also **Plate 200**


Superior nuchal line
Mastoid process
Posterior tubercle of atlas
Spinous process of axis
Semispinalis capitis m.
Semispinalis colli m.
Spinous process of C7 vertebra
External intercostal mm.
Semispinalis thoracis m.
Multifidus thoracis m.
Thoracolumbar fascia (middle layer)
Thoracolumbar fascia (posterior layer) (*cut*)
Transversus abdominis m. and tendon of origin
Multifidus lumborum m.
Erector spinae (*cut*)
Rectus posterior minor capitis m.
Obliquus superior capitis m.
Rectus posterior major capitis m.
Transverse process of atlas
Obliquus inferior capitis m.
Rotatores longi colli
Rotatores breves colli
Interspinalis colli m.
Levatores costarum
Rotatores longi thoracis
Rotatores breves thoracis
Levatores breves costarum
Levatores longi costarum
Interspinalis lumborum m.
Lateral intertransversarii lumborum m.
Quadratus lumborum m.
Iliac crest
Multifidus lumborum m. (*cut*)
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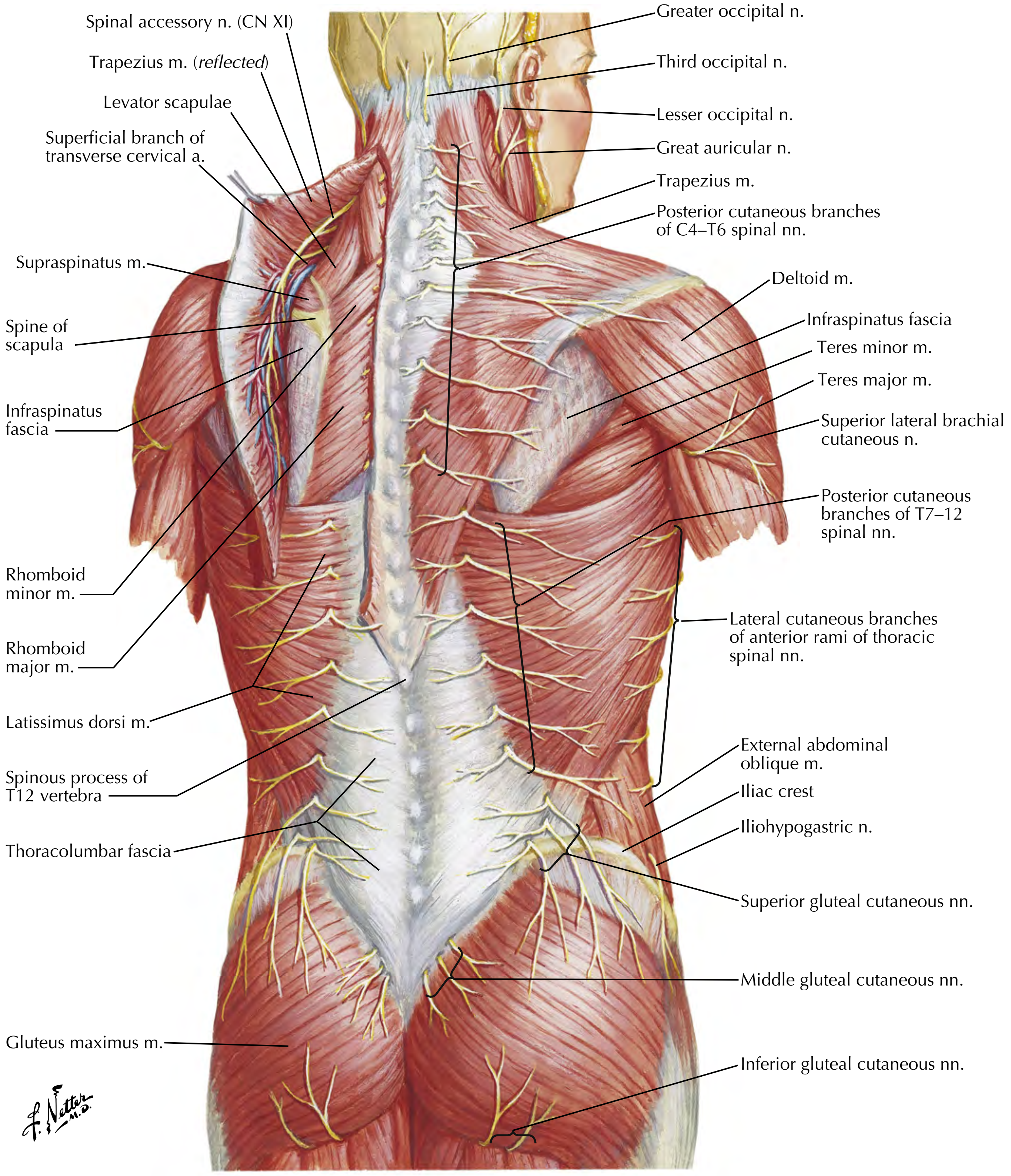
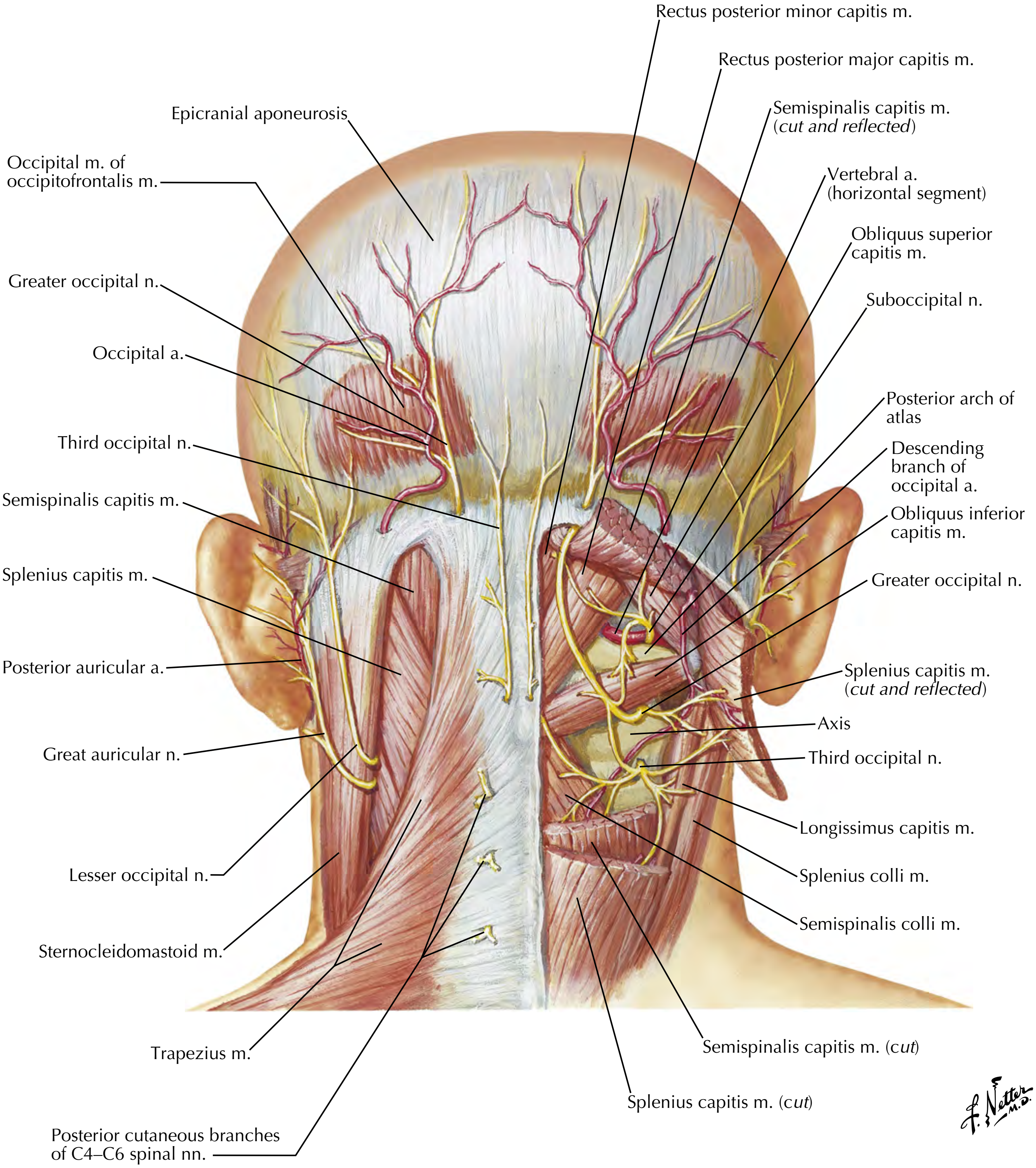

Spinal accessory n. (CN XI)
Trapezius m. (*reflected*)
Levator scapulae
Superficial branch of transverse cervical a.
Supraspinatus m.
Spine of scapula
Infraspinatus fascia
Rhomboid minor m.
Rhomboid major m.
Latissimus dorsi m.
Spinous process of T12 vertebra
Thoracolumbar fascia
Gluteus maximus m.
Greater occipital n.
Third occipital n.
Lesser occipital n.
Great auricular n.
Trapezius m.
Posterior cutaneous branches of C4–T6 spinal nn.
Deltoid m.
Infraspinatus fascia
Teres minor m.
Teres major m.
Superior lateral brachial cutaneous n.
Posterior cutaneous branches of T7–12 spinal nn.
Lateral cutaneous branches of anterior rami of thoracic spinal nn.
External abdominal oblique m.
Iliac crest
Iliohypogastric n.
Superior gluteal cutaneous nn.
Middle gluteal cutaneous nn.
Inferior gluteal cutaneous nn.
F. Netter M.D.

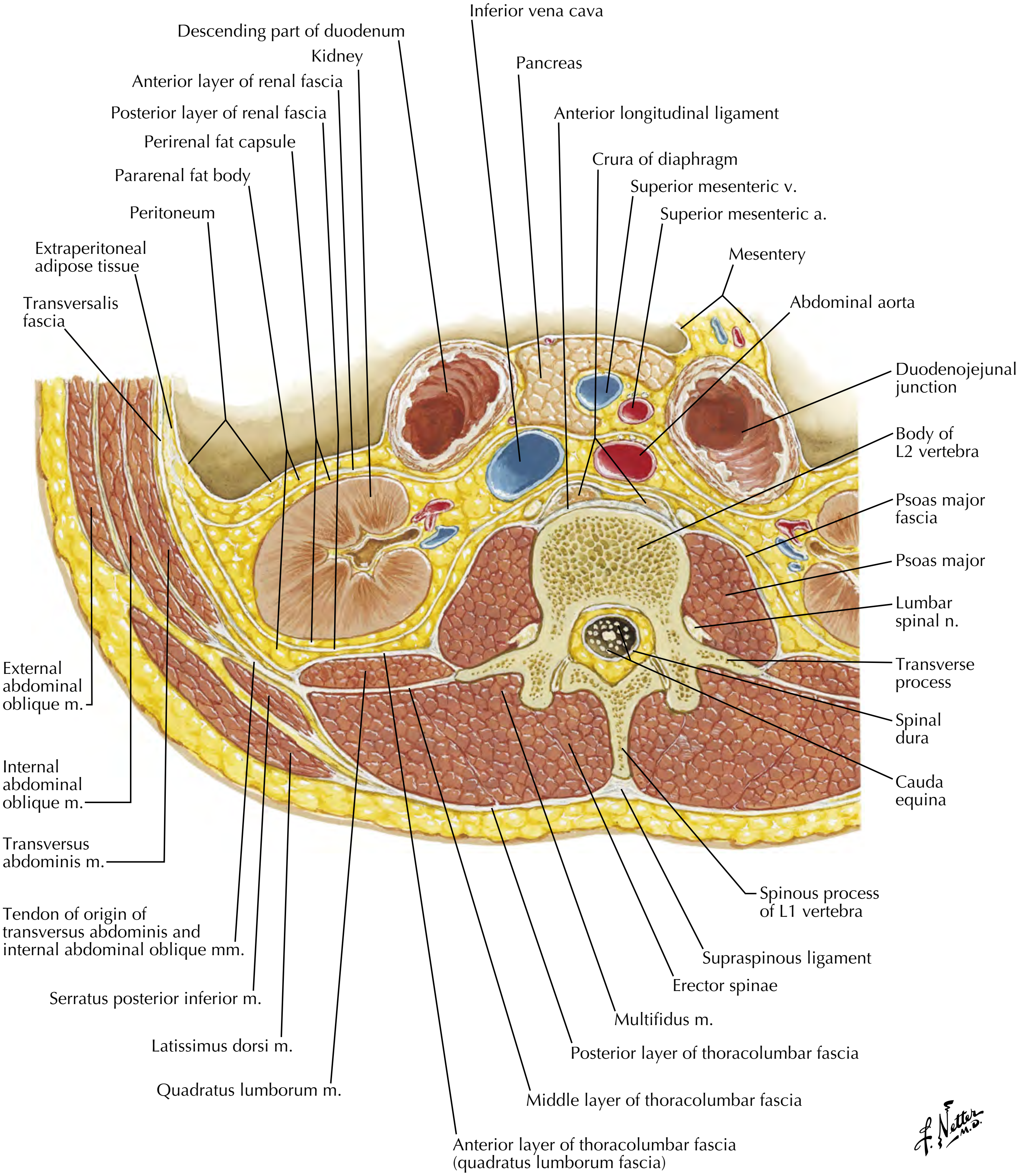
Nerves of Back of Neck

See also **Plates 54, 56**

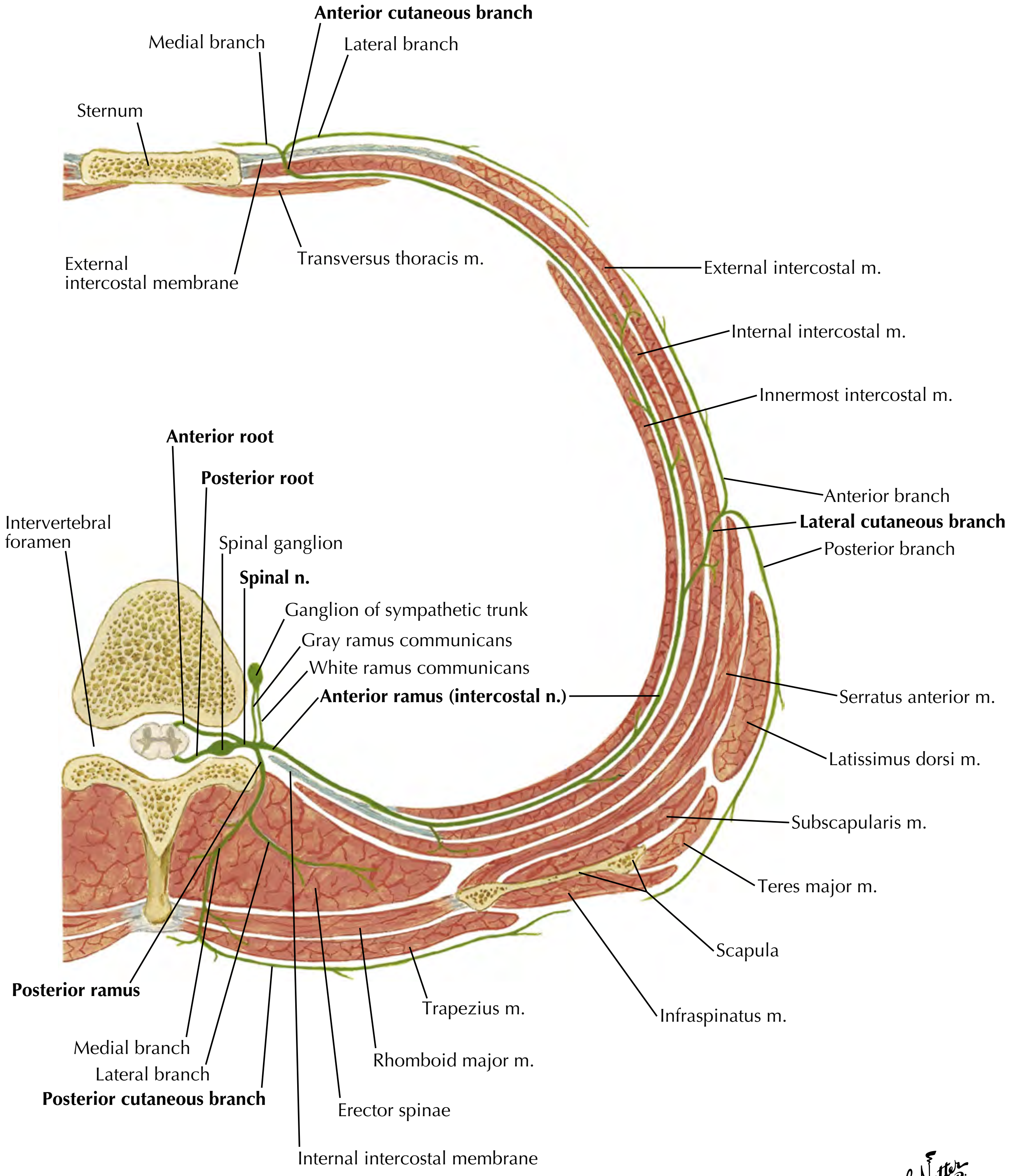

Rectus posterior minor capitis m.
Rectus posterior major capitis m.
Epicranial aponeurosis
Semispinalis capitis m. (*cut and reflected*)
Occipital m. of occipitofrontalis m.
Vertebral a. (horizontal segment)
Obliquus superior capitis m.
Greater occipital n.
Suboccipital n.
Occipital a.
Posterior arch of atlas
Third occipital n.
Descending branch of occipital a.
Semispinalis capitis m.
Obliquus inferior capitis m.
Splenius capitis m.
Greater occipital n.
Posterior auricular a.
Splenius capitis m. (*cut and reflected*)
Axis
Great auricular n.
Third occipital n.
Longissimus capitis m.
Lesser occipital n.
Splenius colli m.
Semispinalis colli m.
Sternocleidomastoid m.
Trapezius m.
Semispinalis capitis m. (*cut*)
Splenius capitis m. (*cut*)
Posterior cutaneous branches of C4–C6 spinal nn.

Lumbar Region of Back: Cross Section

See also **Plates 330, 331, 337**


Inferior vena cava
Descending part of duodenum
Kidney
Pancreas
Anterior layer of renal fascia
Posterior layer of renal fascia
Anterior longitudinal ligament
Perirenal fat capsule
Crura of diaphragm
Pararenal fat body
Superior mesenteric v.
Superior mesenteric a.
Peritoneum
Extraperitoneal adipose tissue
Mesentery
Transversalis fascia
Abdominal aorta
Duodenojejunal junction
Body of L2 vertebra
Psoas major fascia
Psoas major
Lumbar spinal n.
External abdominal oblique m.
Transverse process
Spinal dura
Internal abdominal oblique m.
Cauda equina
Transversus abdominis m.
Spinous process of L1 vertebra
Tendon of origin of transversus abdominis and internal abdominal oblique mm.
Supraspinous ligament
Erector spinae
Serratus posterior inferior m.
Multifidus m.
Latissimus dorsi m.
Posterior layer of thoracolumbar fascia
Quadratus lumborum m.
Middle layer of thoracolumbar fascia
Anterior layer of thoracolumbar fascia (quadratus lumborum fascia)
F. Netter M.D.

See also **Plates 6, 279**


Anterior cutaneous branch
Medial branch
Lateral branch
Sternum
External intercostal membrane
Transversus thoracis m.
External intercostal m.
Internal intercostal m.
Innermost intercostal m.
Anterior root
Posterior root
Intervertebral foramen
Spinal ganglion
Spinal n.
Ganglion of sympathetic trunk
Gray ramus communicans
White ramus communicans
Anterior ramus (intercostal n.)
Anterior branch
Lateral cutaneous branch
Posterior branch
Serratus anterior m.
Latissimus dorsi m.
Subscapularis m.
Teres major m.
Scapula
Infraspinatus m.
Trapezius m.
Posterior ramus
Medial branch
Lateral branch
Posterior cutaneous branch
Rhomboid major m.
Erector spinae
Internal intercostal membrane

Note: *In lower thoracic region, lateral branch of posterior ramus is longer, and motor and cutaneous; medial branch is shorter and motor only.*

ANATOMICAL STRUCTURE	CLINICAL COMMENT	PLATE NUMBERS
Nervous System and Sense Organs		
Conus medullaris	Is inferior limit of spinal cord; can lie as inferior as L4 vertebra in neonates and as superior as T12 in adults (average is L1–L2); necessary to determine its location in procedures such as lumbar puncture; in adults, start at L2 or lower	186
Cauda equina	Lumbar and sacral nerve roots may be anesthetized with anesthesia injected into subarachnoid space (spinal block)	186, 187
Spinal meninges	Access to epidural and subarachnoid spaces is necessary for clinical procedures such as epidural anesthesia and lumbar puncture; meningitis is a life-threatening infection	182, 190
Skeletal System		
Spinous processes	Palpable landmarks used to assess spinal curvatures and determine location of spinal cord for procedures such as lumbar puncture and injection of spinal anesthesia	178, 195
Spinous process of C7 vertebra (vertebra prominens)	Most prominent spinous process in cervical region; often used to begin counting vertebrae	178, 180
Intervertebral disc	Age-related changes may produce herniation of nucleus pulposus, causing back pain; occurs most commonly in lower lumbar regions of vertebral column	181, 187
Lamina of vertebral arch	Surgically removed in laminectomy to gain access to vertebral canal and spinal cord	181
Intervertebral foramen	May become narrowed by age-related changes (e.g., osteophyte formation) or changes in intervertebral disc height, producing compression of its contents	181, 184, 185
Sacral hiatus	Provides access to epidural space for administration of caudal epidural anesthesia	183
Fifth lumbar vertebra	Spondylolysis is clinical condition in which vertebral body separates from part of its vertebral arch bearing inferior articulating process (defect is through pars interarticularis); if this occurs bilaterally, L5 vertebral body and transverse process may slide forward over sacrum, giving rise to spondylolisthesis	184
L5–S1 intervertebral disc	Most common level of intervertebral disc herniation, which may result in nerve compression and lower back pain associated with pain and weakness in ipsilateral lower limb (sciatica)	184, 187
Vertebral foramen	May be congenitally stenotic in cervical region, or narrowed by arthritic changes in lumbar vertebrae; can lead to back pain, sciatica, numbness or tingling, and weakness in lower limbs	180, 181
Muscular System		
Trapezius muscle	Responsible for holding scapula against thoracic wall against gravity; drooping of shoulder may indicate injury to spinal accessory nerve	195
Deep (or intrinsic) back muscles	Microscopic stretching or tearing of muscle fibers produces back strain, a common cause of low back pain	196, 197
Cardiovascular System		
Arteries of spinal cord	Narrowing or damage caused by atherosclerosis, vertebral fractures, or vertebral dislocations may cause ischemia of spinal cord	191
Vertebral venous plexuses	Mostly valveless veins along vertebral column allow retrograde flow and can act as conduits for metastasis of cancer cells to spine, lungs, and brain	194, BP 39

*Selections were based largely on clinical data and commonly discussed clinical correlations in macroscopic ("gross") anatomy courses.

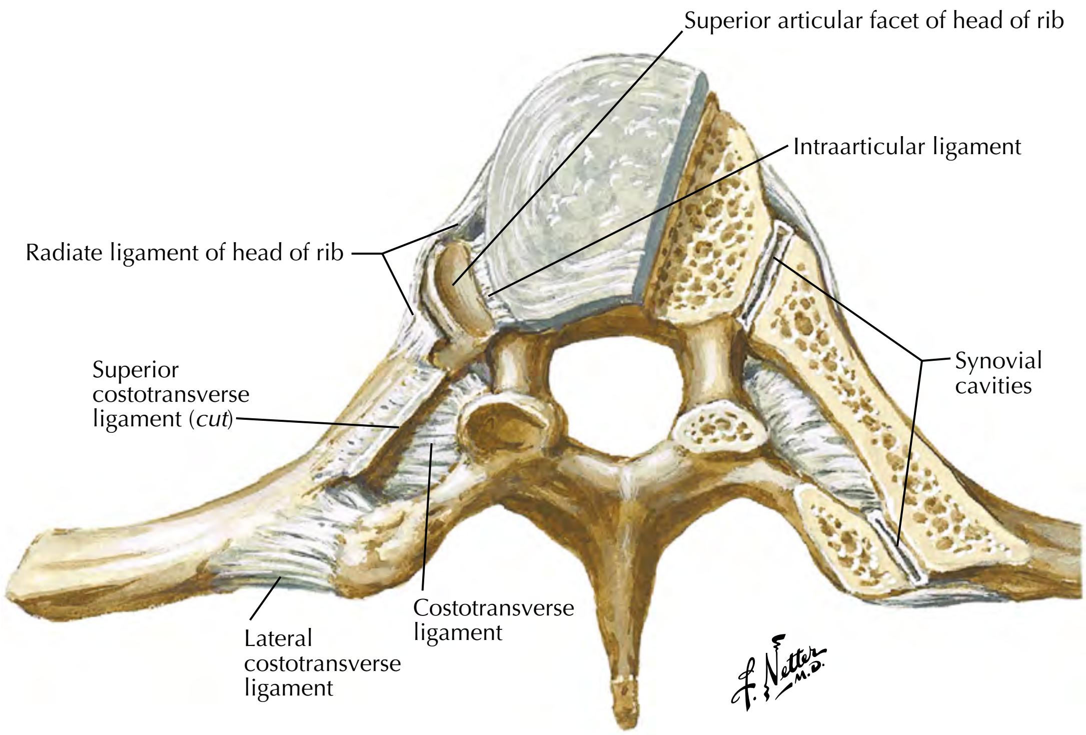
MUSCLE	MUSCLE GROUP	SUPERIOR ATTACHMENT	INFERIOR ATTACHMENT	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Iliocostalis mm.	Deep back (erector spinae)	*Colli muscle:* posterior tubercles of C4–C6 vertebrae	*Colli muscle:* angles of ribs 3–6	Posterior rami of spinal nerves	*Cervical portions:* occipital, deep cervical, and vertebral arteries	Extend and laterally bend vertebral column and head
		Thoracis muscle: angles of ribs 1–6	*Thoracis muscle:* angles of ribs 7–12		*Thoracic portions:* dorsal branches of posterior intercostal and subcostal arteries	
		Lumborum muscle: ribs 4–12, transverse processes of L1–L4 vertebrae	*Lumborum muscle:* sacrum (via erector spinae aponeurosis), iliac crest		*Lumbar portions:* dorsal branches of lumbar and lateral sacral arteries	
Interspinalis mm.	Deep back	*Colli muscle:* spinous processes of C2–C7 vertebrae	Spinous processes of vertebrae subjacent to vertebrae of muscle origin	Posterior rami of spinal nerves	*Cervical portions:* occipital, deep cervical, and vertebral arteries	Aid in extension of vertebral column
		Thoracis muscle: spinous processes of T1–T2 and T11–T12 vertebrae			*Thoracic portions:* dorsal branches of posterior intercostal and subcostal arteries	
		Lumborum muscle: spinous processes of L1–L4 vertebrae			*Lumbar portions:* dorsal branches of lumbar arteries	
Intertransversarii mm.	Deep back	*Medial muscles:* transverse processes of C1–C7 and T10–T12 vertebrae, mammillary processes of L1–L4 vertebrae	*Medial muscles:* transverse processes of subjacent cervical and thoracic vertebrae, mammillary processes of subjacent lumbar vertebrae	*Medial muscles:* posterior rami of spinal nerves	*Cervical portions:* occipital, deep cervical, and vertebral arteries *Thoracic portions:* dorsal branches of posterior intercostal and subcostal arteries	Assist in lateral flexion of vertebral column
		Lateral and anterior muscles: transverse processes of C1–C7 and L1–L4 vertebrae	*Lateral and anterior muscles:* transverse processes of subjacent vertebrae	*Lateral and anterior muscles:* anterior rami of spinal nerves	*Lumbar portions:* dorsal branches of lumbar arteries	
Latissimus dorsi m.	Superficial back	Spinous processes of T7–T12 vertebrae, posterior layer of thoracolumbar fascia (and thus to L1–L5 vertebrae and iliac crest), ribs 10–12	Intertubercular sulcus of humerus	Thoracodorsal nerve	Thoracodorsal artery, dorsal perforating branches of 9th, 10th, and 11th posterior intercostal, subcostal, and first three lumbar arteries	Extends, adducts, and medially rotates humerus
Levator scapulae	Superficial back	Transverse processes of atlas and axis, posterior tubercles of transverse processes of C3–C4 vertebrae	Medial border of scapula (superior to spine)	Anterior rami of C3–C4 spinal nerves, dorsal scapular nerve	Dorsal scapular and transverse and ascending cervical arteries	Elevates scapula medially, inferiorly rotates glenoid fossa
Longissimus mm.	Deep back (erector spinae)	*Capitis muscle:* mastoid process	*Capitis muscle:* transverse processes of C4–T4 vertebrae	Posterior rami of spinal nerves	*Cervical portions:* occipital, deep cervical, and vertebral arteries	Extend and laterally bend vertebral column and head
		Colli muscle: transverse processes of C2–C6 vertebrae	*Colli muscle:* transverse processes of T1–T5 vertebrae		*Thoracic portions:* dorsal branches of posterior intercostal and subcostal arteries	
		Thoracis muscle: transverse processes of T1–T12 vertebrae, ribs 5–12, accessory and transverse processes of L1–L5 vertebrae	*Thoracis muscle:* spinous processes of L1–L5 vertebrae, posterior surface of sacrum, iliac tuberosity, posterior sacroiliac ligament		*Lumbar portions:* dorsal branches of lumbar and lateral sacral arteries	

MUSCLE	MUSCLE GROUP	SUPERIOR ATTACHMENT	INFERIOR ATTACHMENT	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Multifidus mm.	Deep back (transversospinales)	Spinous processes of C2–L5 vertebrae (2–5 levels above muscle insertion)	*Colli muscle:* superior articular processes of C4–C7 vertebrae	Posterior rami of spinal nerves	*Cervical portions:* occipital, deep cervical, and vertebral arteries	Stabilize spine
			Thoracis muscle: transverse processes of T1–T12 vertebrae		*Thoracic portions:* dorsal branches of posterior intercostal and subcostal arteries	
			Lumborum muscle: mammillary processes of L1–L5 vertebrae, sacrum, iliac crest		*Lumbar portions:* dorsal branches of lumbar and lateral sacral arteries	
Obliquus inferior capitis m.	Suboccipital	Transverse process of atlas	Spinous process of axis	Suboccipital nerve	Vertebral artery and occipital arteries	Rotates atlas to turn face to same side
Obliquus superior capitis m.	Suboccipital	Lateral part of inferior nuchal line	Transverse process of atlas	Suboccipital nerve	Vertebral and occipital arteries	Extends and bends head laterally
Rectus posterior major capitis m.	Suboccipital	Middle part of inferior nuchal line	Spinous process of axis	Suboccipital nerve	Vertebral and occipital arteries	Extends and rotates head to same side
Rectus posterior minor capitis m.	Suboccipital	Medial part of inferior nuchal line	Posterior tubercle of atlas	Suboccipital nerve	Vertebral and occipital arteries	Extends head
Rhomboid major m.	Superficial back	Spinous processes of T2–T5 vertebrae	Medial border of scapula (inferior to spine of scapula)	Dorsal scapular nerve	Dorsal scapular artery *OR* deep branch of transverse cervical artery, dorsal perforating branches of upper five or six posterior intercostal arteries	Fixes scapula to thoracic wall and retracts and rotates it to depress glenoid fossa
Rhomboid minor m.	Superficial back	Nuchal ligament, spinous processes of C7 and T1 vertebrae	Medial border of scapula (at spine of scapula)	Dorsal scapular nerve	Dorsal scapular artery *OR* deep branch of transverse cervical artery, dorsal perforating branches of upper five or six posterior intercostal arteries	Fixes scapula to thoracic wall and retracts and rotates it to depress glenoid fossa
Rotatores	Deep back (transversospinales)	*Colli muscle:* spinous processes of cervical vertebrae	*Colli muscle:* superior articular processes of cervical vertebrae 1 or 2 levels below vertebra of muscle origin	Posterior rami of spinal nerves	*Cervical portions:* occipital, deep cervical, and vertebral arteries	Stabilize, extend, and rotate spine
		Thoracis muscle: spinous processes and laminae of T1–T11 vertebrae	*Thoracis muscle:* transverse processes of T2–T12 vertebrae (brevis muscles insert into adjacent vertebra; longus muscles into vertebra 2 levels down)		*Thoracic portions:* dorsal branches of posterior intercostal and subcostal arteries	
		Lumborum muscle: spinous processes of lumbar vertebrae	*Lumborum muscle:* mammillary processes of lumbar vertebrae 2 levels down		*Lumbar portions:* dorsal branches of lumbar arteries	

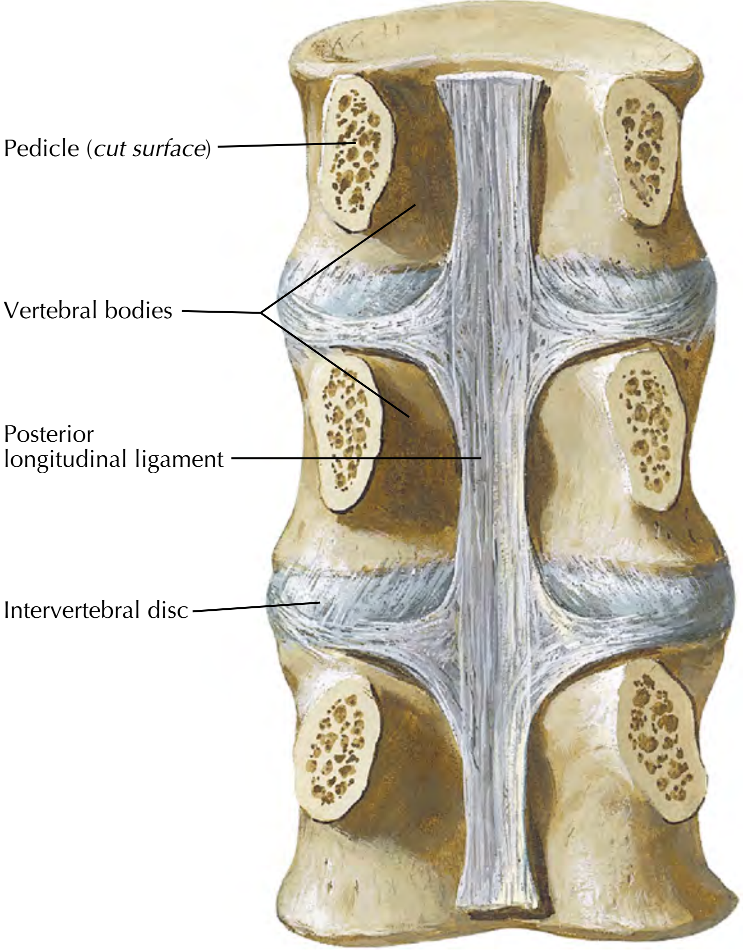
MUSCLE	MUSCLE GROUP	SUPERIOR ATTACHMENT	INFERIOR ATTACHMENT	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Semispinalis mm.	Deep back (transversospinales)	*Capitis muscle:* occipital bone (between superior and inferior nuchal lines) *Colli muscle:* spinous processes of C2–C5 vertebrae *Thoracis muscle:* spinous processes of C6–T4 vertebrae	*Capitis muscle:* superior articular processes of C4–C7 vertebrae, transverse processes of T1–T6 vertebrae *Colli muscle:* transverse processes of T1–T6 vertebrae *Thoracis muscle:* transverse processes of T6–T10 vertebrae	Posterior rami of spinal nerves	*Cervical portions:* occipital, deep cervical, and vertebral arteries *Thoracic portions:* dorsal branches of posterior intercostal arteries	Extend head and neck and rotate them to opposite side
Serratus posterior inferior m.	Superficial back	Inferior aspect of ribs 9–12	Spinous processes of T11–L2 vertebrae	Anterior rami of T9–T12 spinal nerves	Posterior intercostal arteries	Depresses ribs
Serratus posterior superior m.	Superficial back	Nuchal ligament, spinous processes of C7–T3 vertebrae	Superior aspect of ribs 2–5	Anterior rami of T2–T5 spinal nerves	Posterior intercostal arteries	Elevates ribs
Spinalis mm.	Deep back (erector spinae)	*Capitis muscle:* external occipital protuberance *Colli muscle:* spinous processes of C2–C4 vertebrae *Thoracis muscle:* spinous processes of T2–T8 vertebrae	*Capitis muscle:* spinous processes of C7 and T1 vertebrae *Colli muscle:* spinous processes of C7–T2 vertebrae *Thoracis muscle:* spinous processes of T11–L2 vertebrae	Posterior rami of spinal nerves	*Cervical portions:* occipital, deep cervical, and vertebral arteries *Thoracic portions:* dorsal branches of posterior intercostal and subcostal arteries *Lumbar portions:* dorsal branches of lumbar and lateral sacral arteries	Extend and laterally bend vertebral column and head
Splenius capitis m.	Spinotransversales	Mastoid process of temporal bone, lateral one-third of superior nuchal line	Nuchal ligament, spinous processes of C7–T4 vertebrae	Posterior rami of C2–C3 spinal nerves	Occipital artery and deep cervical arteries	*Bilaterally:* extends head *Unilaterally:* laterally bends (flexes) and rotates face to same side
Splenius colli m.	Spinotransversales	Transverse processes of C1–C3 vertebrae	Spinous processes of T3–T6 vertebrae	Posterior rami of C4–C6 spinal nerves	Occipital and deep cervical arteries	*Bilaterally:* extends neck *Unilaterally:* laterally bends (flexes) and rotates neck toward same side
Trapezius m.	Superficial back	*Descending part:* superior nuchal line, external occipital protuberance, nuchal ligament *Transverse part:* spinous processes of C7–T3 vertebrae *Ascending part:* spinous processes of T4–T12 vertebrae	*Descending part:* lateral one-third of clavicle *Transverse part:* acromion *Ascending part:* spine of scapula	Spinal accessory nerve (CN XI)	Transverse cervical and posterior intercostal arteries	Elevates, retracts, and rotates scapula; lower fibers depress scapula

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.

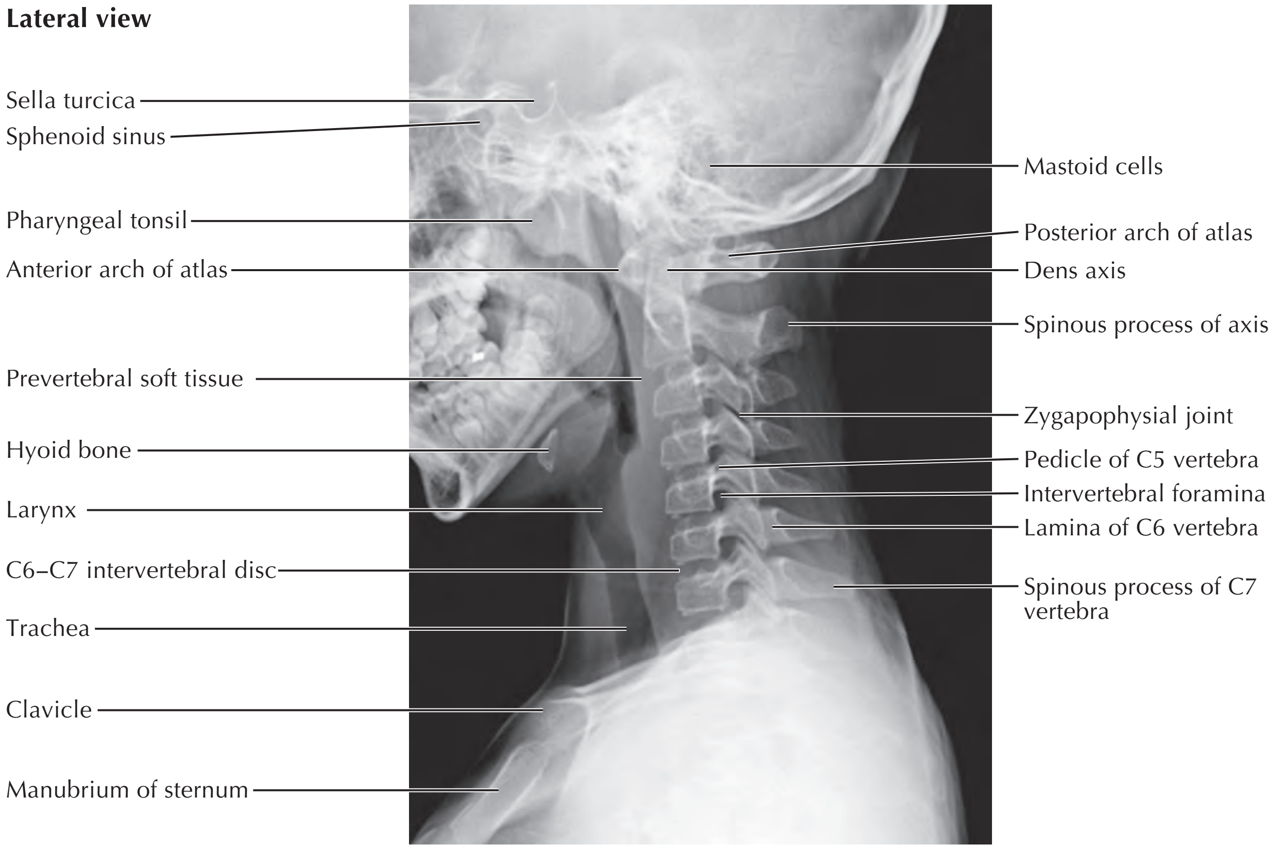
Thoracic vertebra: superior view of transverse section


Superior articular facet of head of rib
Intraarticular ligament
Radiate ligament of head of rib
Synovial cavities
Superior costotransverse ligament (*cut*)
Costotransverse ligament
Lateral costotransverse ligament
F. Netter M.D.

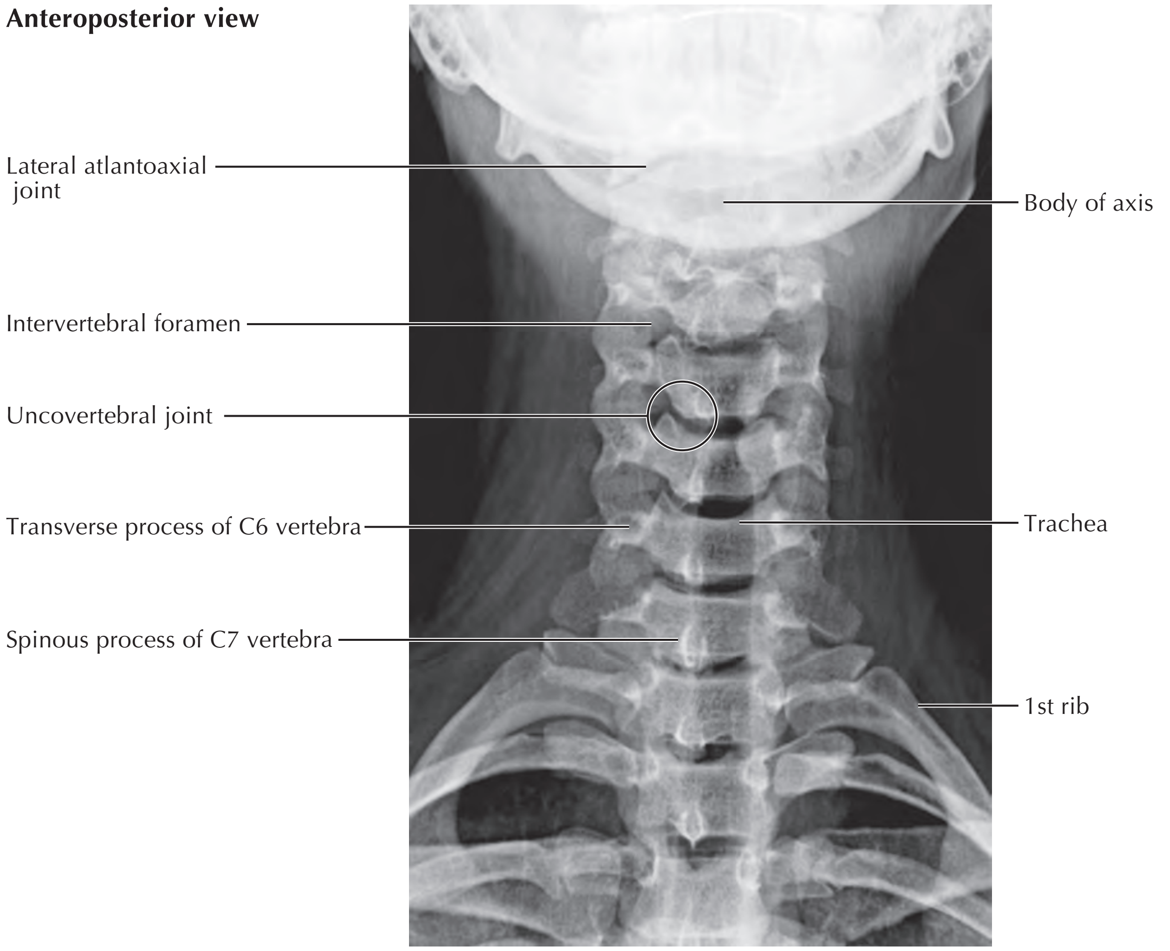
Lumbar vertebral bodies: posterior view (*pedicles sectioned*)


Pedicle (*cut surface*)
Vertebral bodies
Posterior longitudinal ligament
Intervertebral disc

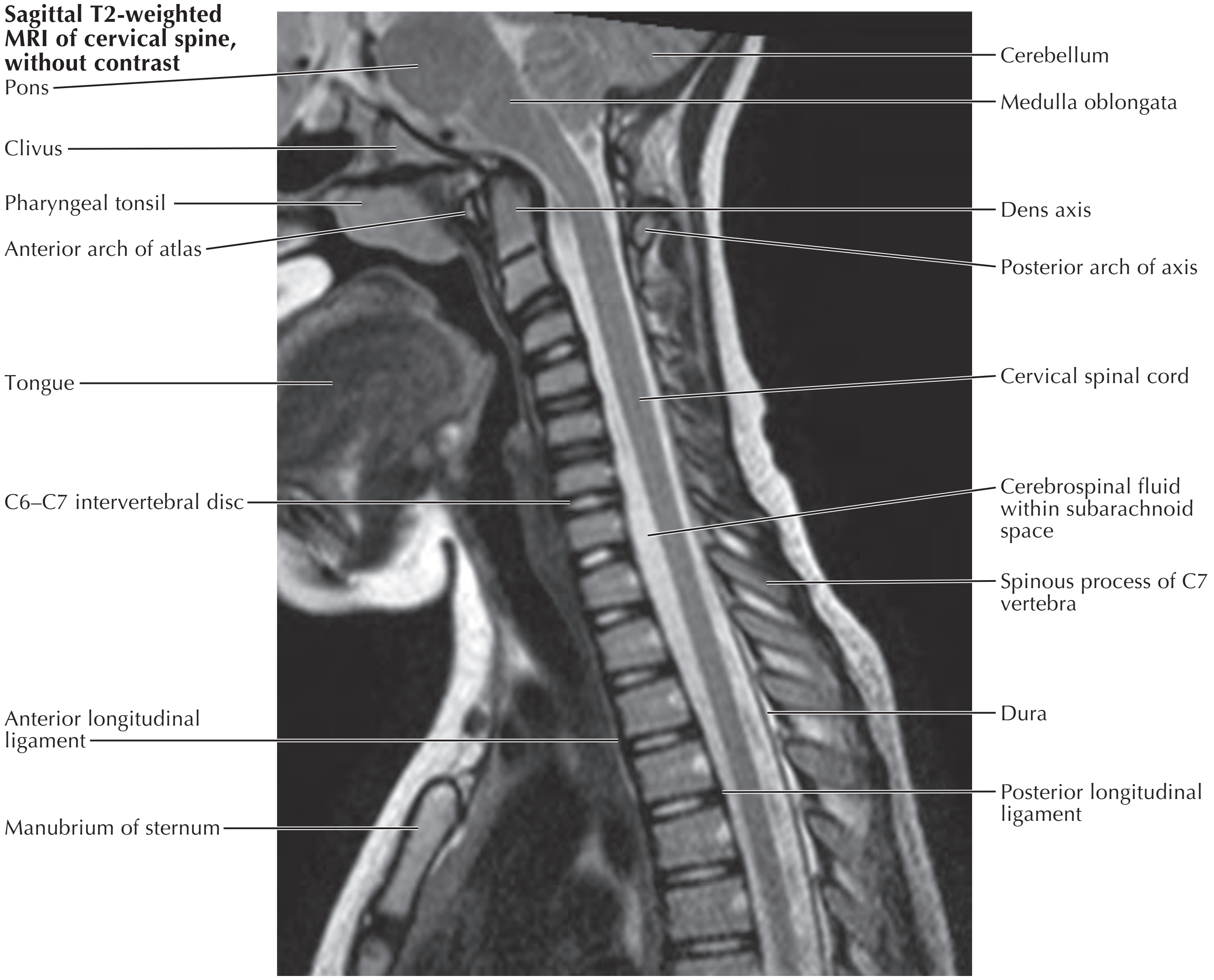
Lateral view


Sella turcica
Sphenoid sinus
Pharyngeal tonsil
Anterior arch of atlas
Prevertebral soft tissue
Hyoid bone
Larynx
C6–C7 intervertebral disc
Trachea
Clavicle
Manubrium of sternum
Mastoid cells
Posterior arch of atlas
Dens axis
Spinous process of axis
Zygapophysial joint
Pedicle of C5 vertebra
Intervertebral foramina
Lamina of C6 vertebra
Spinous process of C7 vertebra

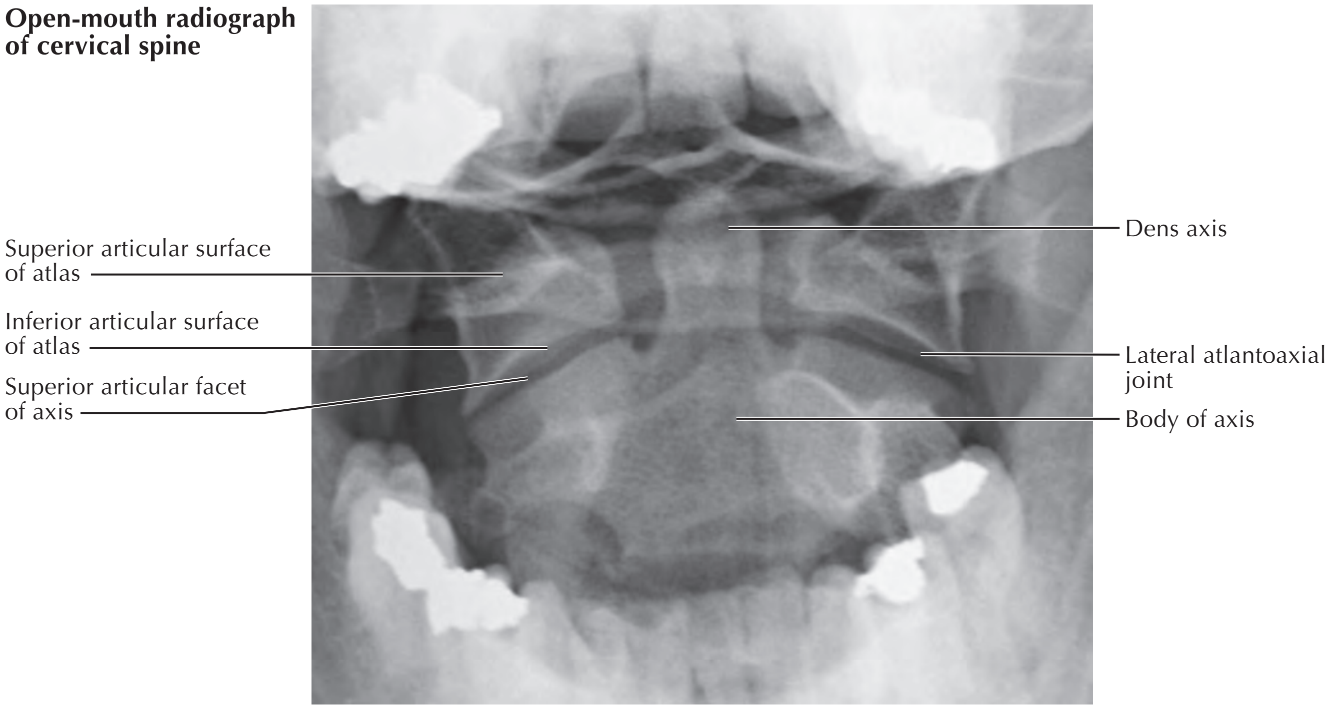
Anteroposterior view


Lateral atlantoaxial joint
Intervertebral foramen
Uncovertebral joint
Transverse process of C6 vertebra
Spinous process of C7 vertebra
Body of axis
Trachea
1st rib

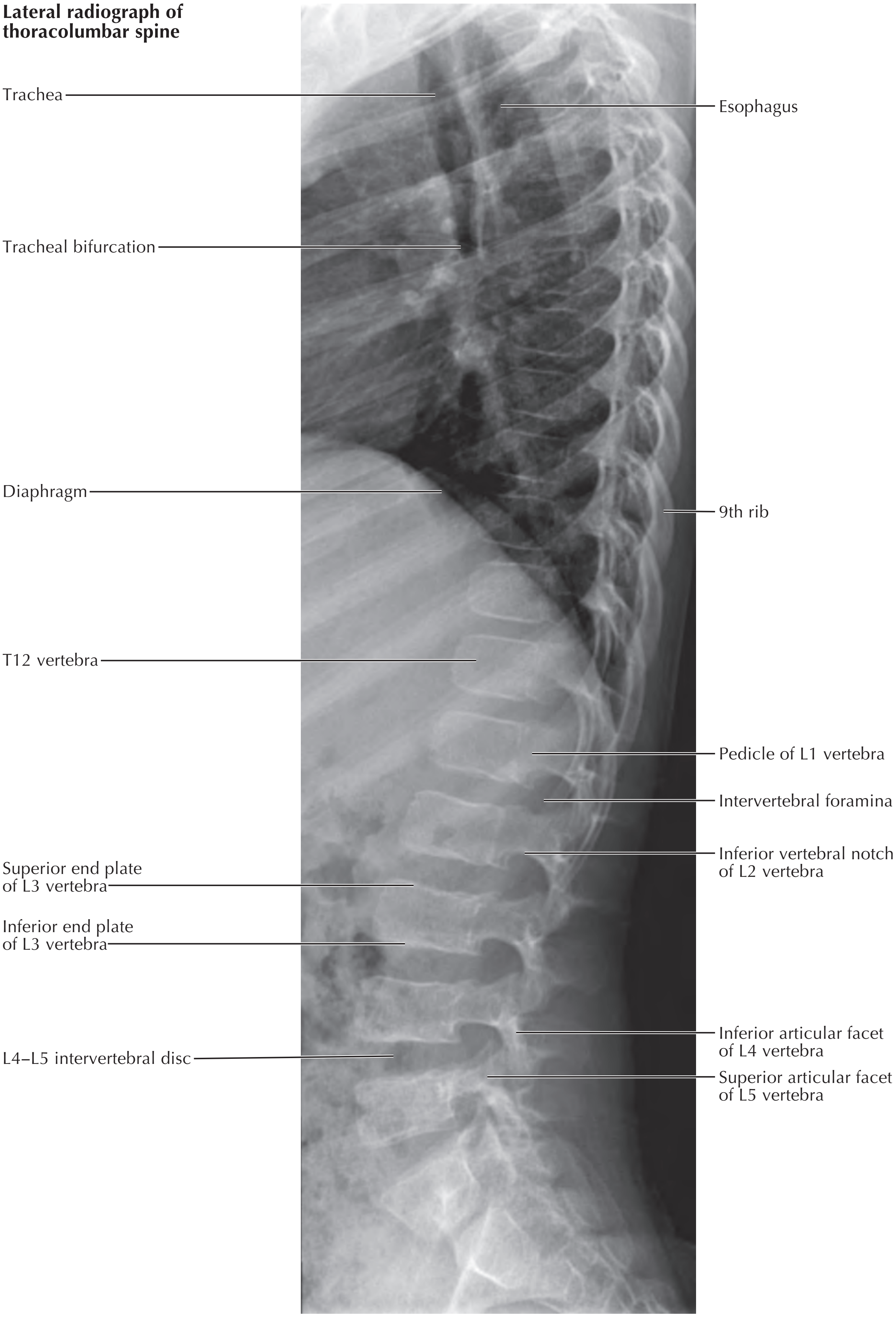
Sagittal T2-weighted MRI of cervical spine, without contrast


Pons
Clivus
Pharyngeal tonsil
Anterior arch of atlas
Tongue
C6–C7 intervertebral disc
Anterior longitudinal ligament
Manubrium of sternum
Cerebellum
Medulla oblongata
Dens axis
Posterior arch of axis
Cervical spinal cord
Cerebrospinal fluid within subarachnoid space
Spinous process of C7 vertebra
Dura
Posterior longitudinal ligament

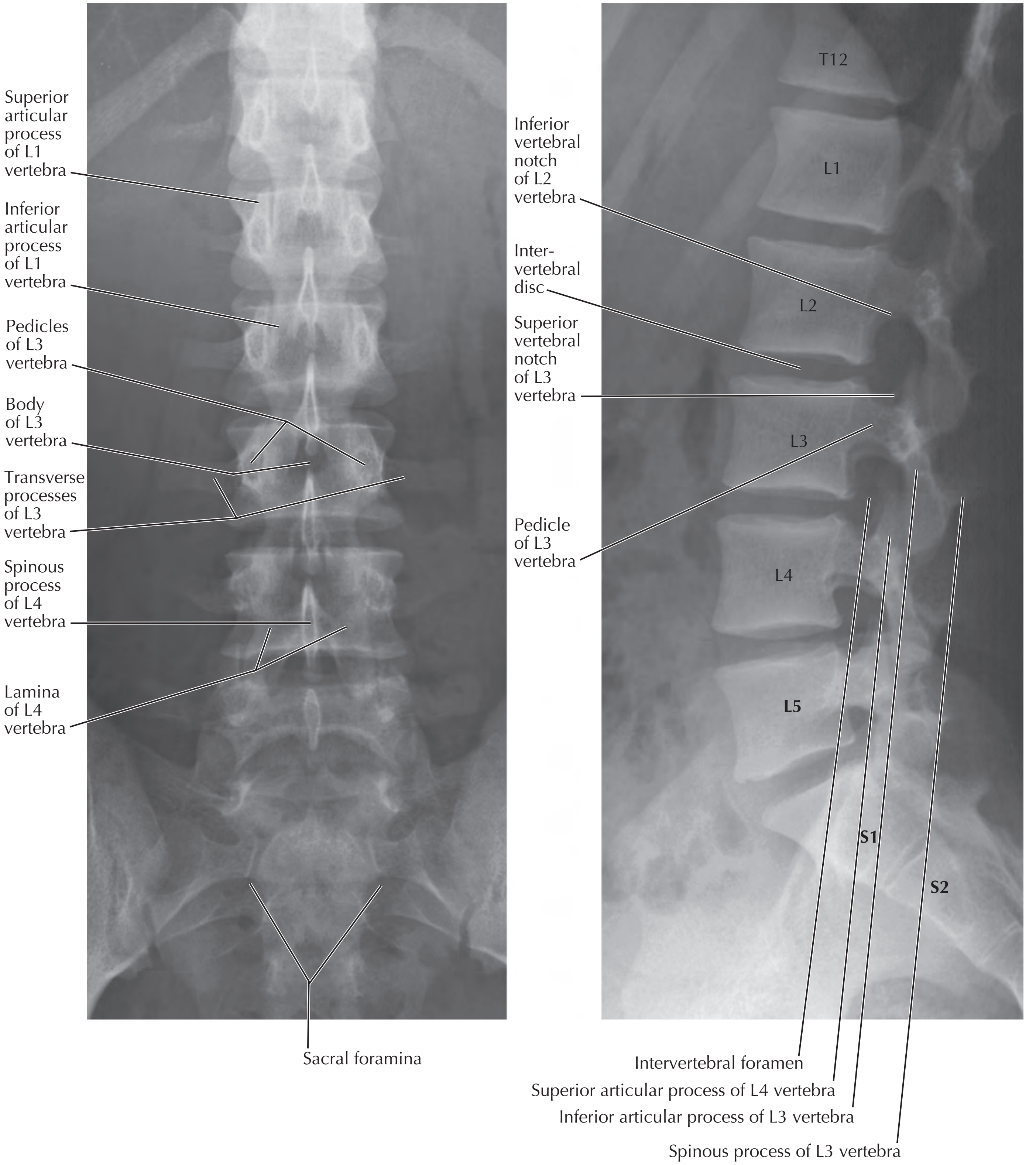
Open-mouth radiograph of cervical spine


Superior articular surface of atlas
Inferior articular surface of atlas
Superior articular facet of axis
Dens axis
Lateral atlantoaxial joint
Body of axis

Lateral radiograph of thoracolumbar spine


Trachea
Esophagus
Tracheal bifurcation
Diaphragm
9th rib
T12 vertebra
Pedicle of L1 vertebra
Intervertebral foramina
Inferior vertebral notch of L2 vertebra
Superior end plate of L3 vertebra
Inferior end plate of L3 vertebra
Inferior articular facet of L4 vertebra
L4–L5 intervertebral disc
Superior articular facet of L5 vertebra

Radiographs of lumbar vertebrae



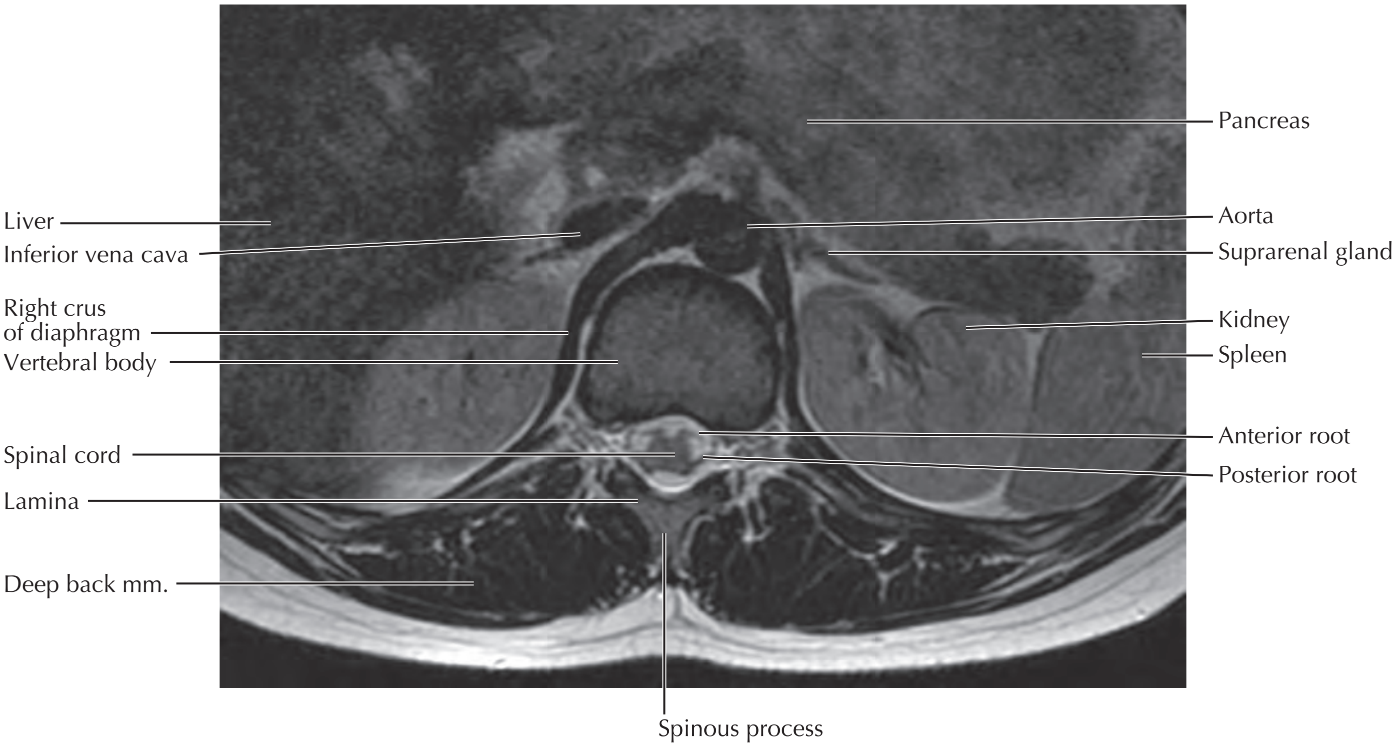
Anteroposterior radiograph

Lateral radiograph

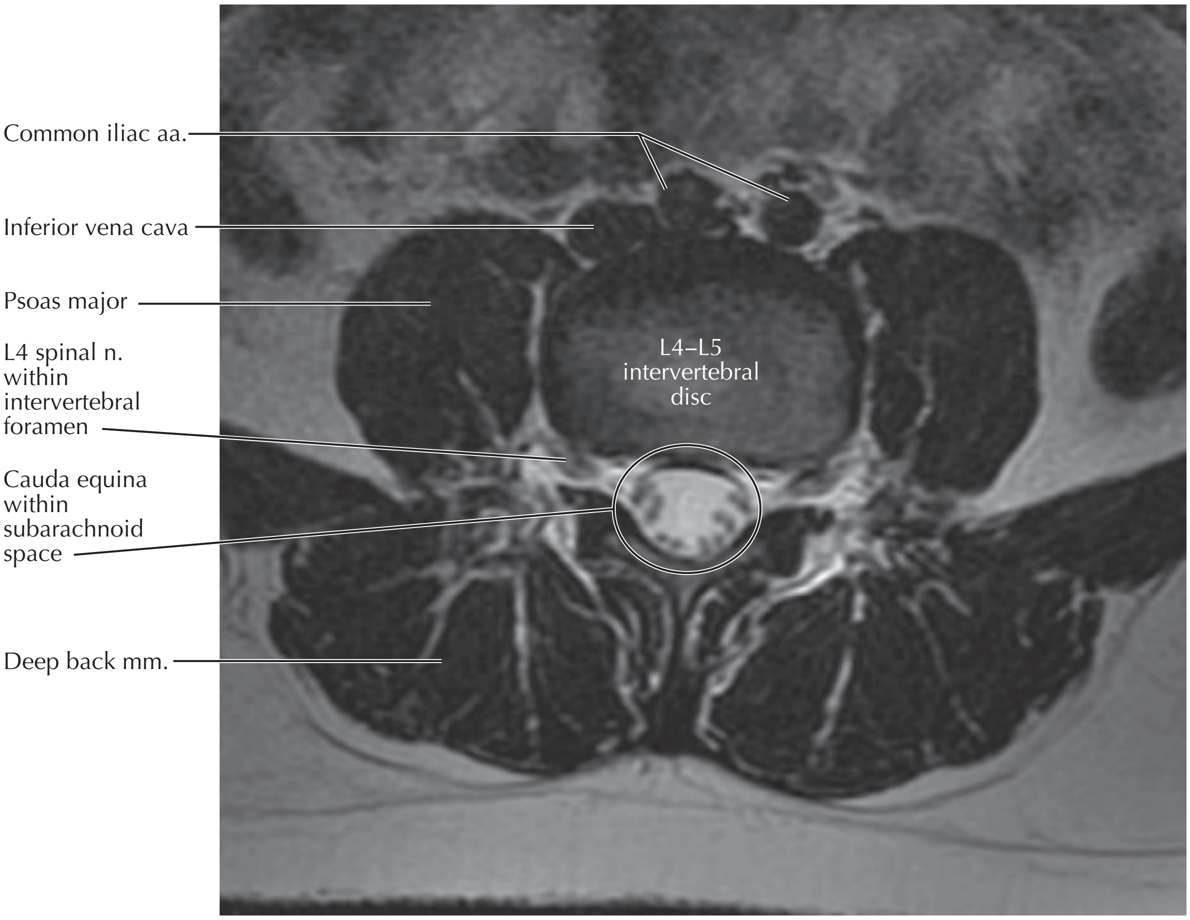
Superior articular process of L1 vertebra
Inferior articular process of L1 vertebra
Pedicles of L3 vertebra
Body of L3 vertebra
Transverse processes of L3 vertebra
Spinous process of L4 vertebra
Lamina of L4 vertebra
Sacral foramina
T12
L1
L2
L3
L4
L5
S1
S2
Inferior vertebral notch of L2 vertebra
Inter-vertebral disc
Superior vertebral notch of L3 vertebra
Pedicle of L3 vertebra
Intervertebral foramen
Superior articular process of L4 vertebra
Inferior articular process of L3 vertebra
Spinous process of L3 vertebra

Note: *The vertebral bodies are numbered.*

Axial T2-weighted MRI section through upper lumbar level, without contrast

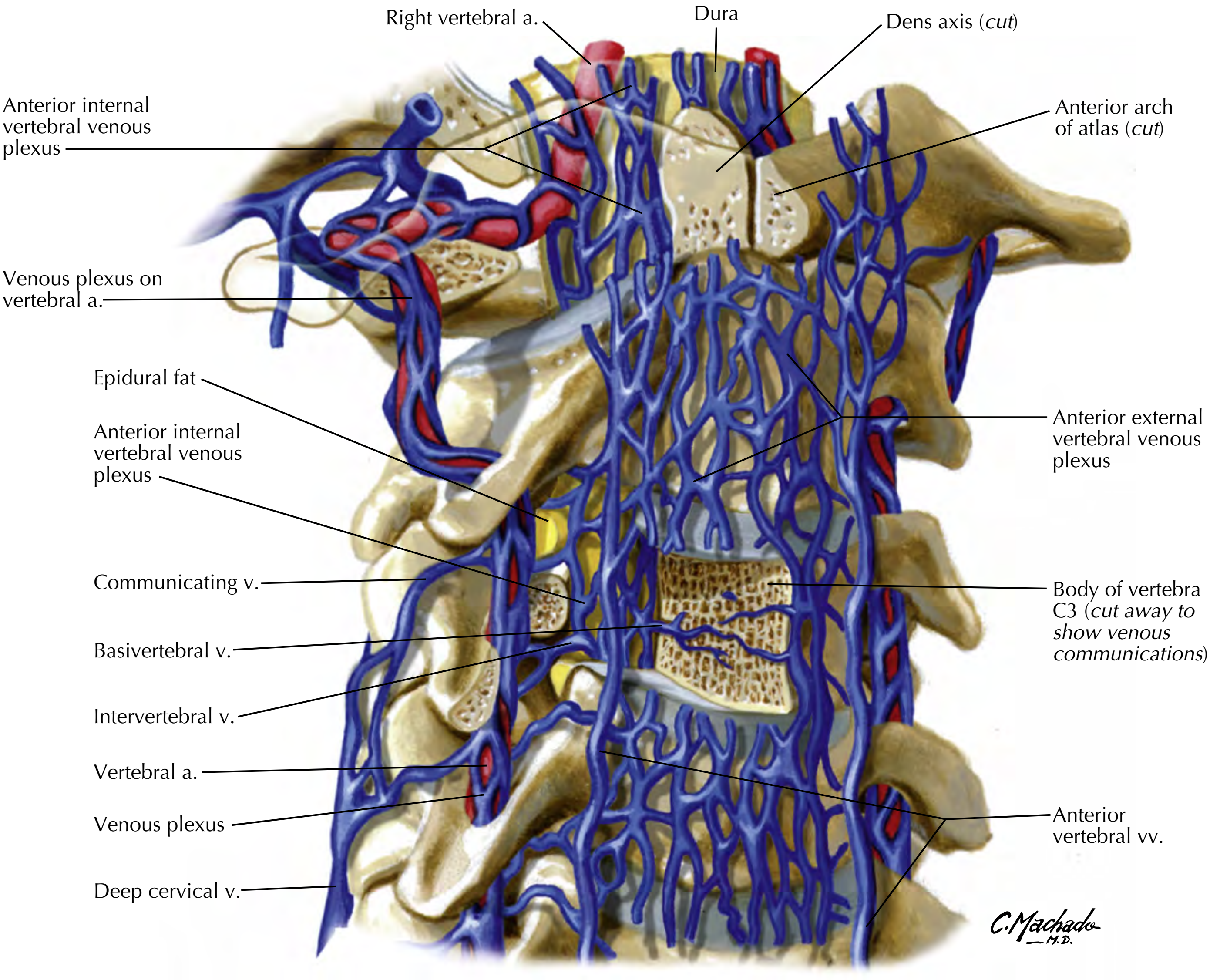

Pancreas
Liver
Aorta
Inferior vena cava
Suprarenal gland
Right crus of diaphragm
Kidney
Vertebral body
Spleen
Anterior root
Spinal cord
Posterior root
Lamina
Deep back mm.
Spinous process

Axial T2-weighted MRI section through lower lumbar level, without contrast


Common iliac aa.
Inferior vena cava
Psoas major
L4–L5 intervertebral disc
L4 spinal n. within intervertebral foramen
Cauda equina within subarachnoid space
Deep back mm.

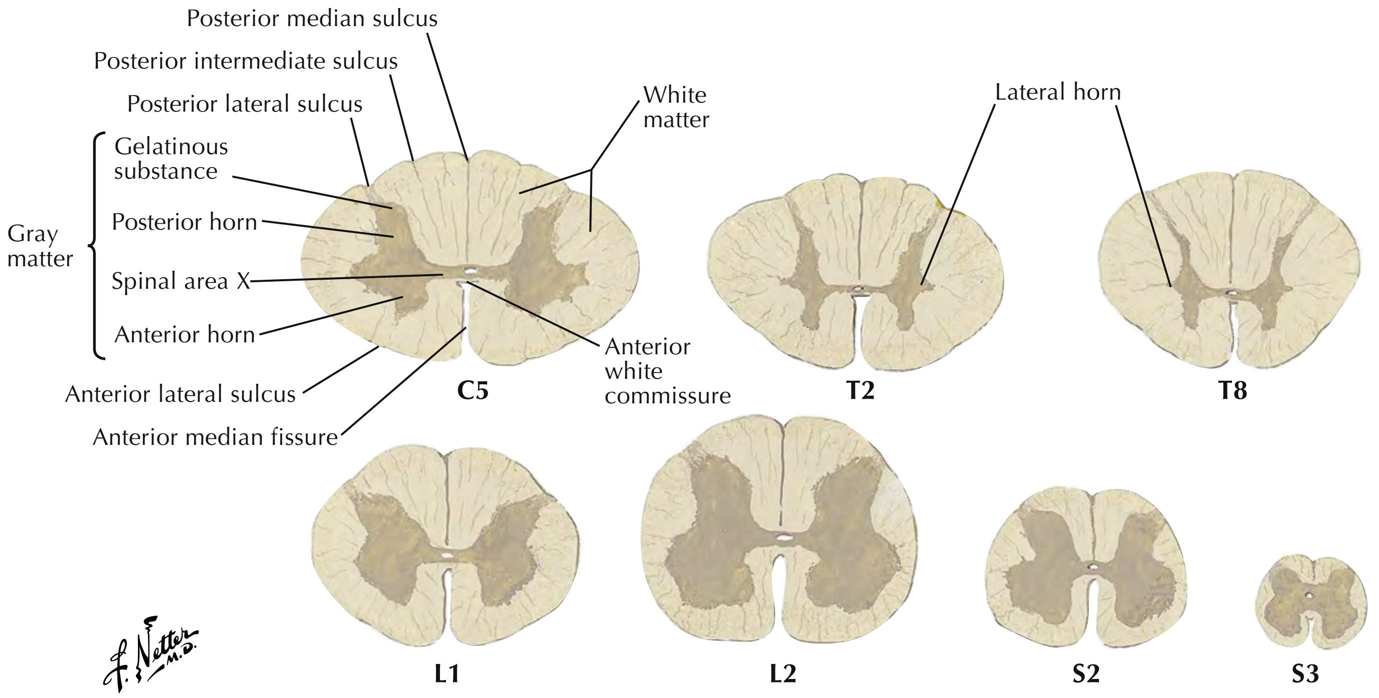
Vertebral Veins: Detail Showing Venous Communications

See also **Plates 193, 194**


Right vertebral a.
Dura
Dens axis (*cut*)
Anterior internal vertebral venous plexus
Anterior arch of atlas (*cut*)
Venous plexus on vertebral a.
Epidural fat
Anterior internal vertebral venous plexus
Anterior external vertebral venous plexus
Communicating v.
Body of vertebra C3 (*cut away to show venous communications*)
Basivertebral v.
Intervertebral v.
Vertebral a.
Venous plexus
Anterior vertebral vv.
Deep cervical v.
C.Machado M.D.

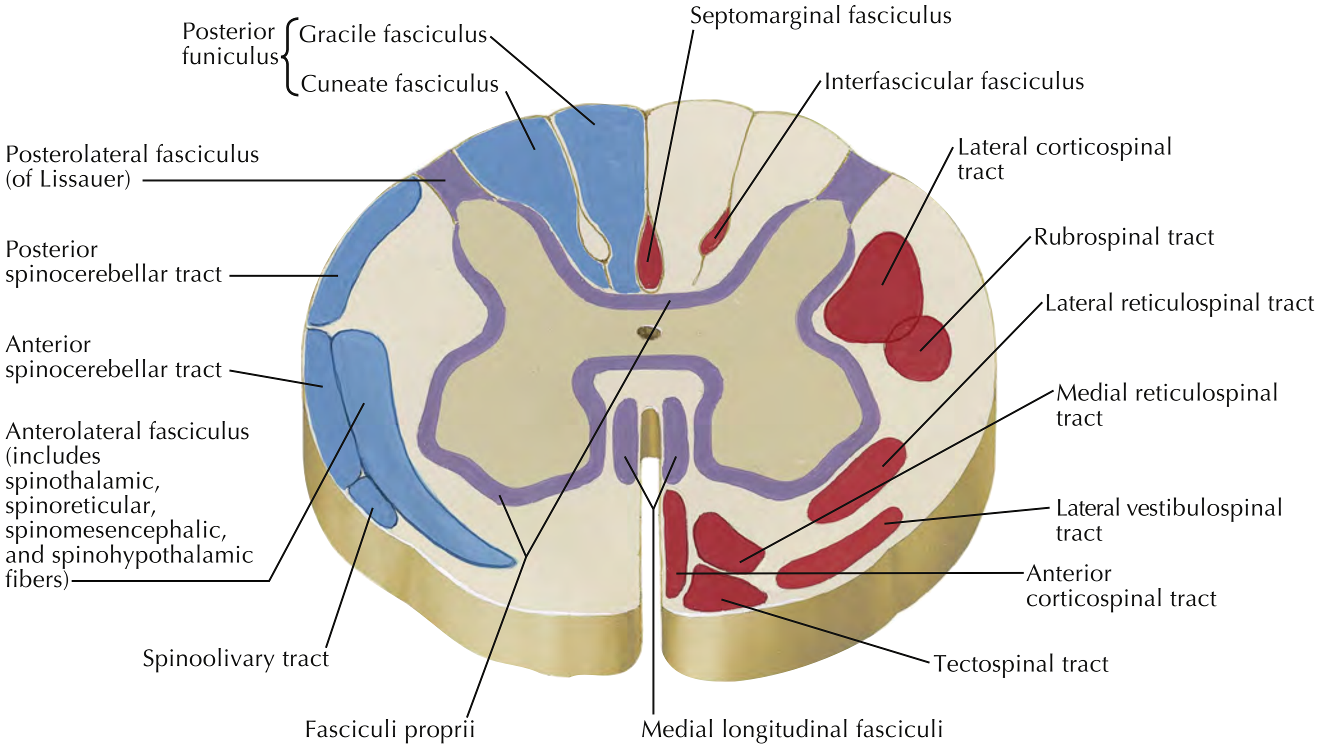
Spinal Cord Cross Sections: Fiber Tracts

Sections through spinal cord at various levels


Posterior median sulcus
Posterior intermediate sulcus
Posterior lateral sulcus
White matter
Lateral horn
Gray matter
Gelatinous substance
Posterior horn
Spinal area X
Anterior horn
Anterior lateral sulcus
Anterior median fissure
Anterior white commissure
C5
T2
T8
L1
L2
S2
S3

Principal fiber tracts of spinal cord

🟦 **Ascending pathways**
🟥 **Descending pathways**
🟪 **Fibers passing in both directions**


Posterior funiculus
Gracile fasciculus
Cuneate fasciculus
Septomarginal fasciculus
Interfascicular fasciculus
Posterolateral fasciculus (of Lissauer)
Lateral corticospinal tract
Rubrospinal tract
Posterior spinocerebellar tract
Lateral reticulospinal tract
Anterior spinocerebellar tract
Medial reticulospinal tract
Anterolateral fasciculus (includes spinothalamic, spinoreticular, spinomesencephalic, and spinohypothalamic fibers)
Lateral vestibulospinal tract
Anterior corticospinal tract
Spinoolivary tract
Tectospinal tract
Fasciculi proprii
Medial longitudinal fasciculi

THORAX

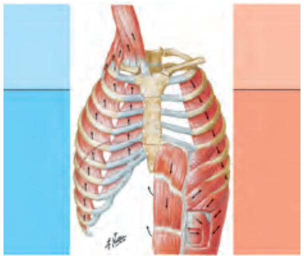
4

Surface Anatomy 202
Thoracic Skeleton 203–204
Mammary Glands 205–208
Thoracic Wall and Diaphragm 209–216
Lungs, Trachea, and Bronchi 217–230
Heart 231–250
Mediastinum 251–261
Cross-Sectional Anatomy 262–266
Structures with High Clinical Significance Tables 4.1–4.3
Muscles Table 4.4
Electronic Bonus Plates BP 41–BP 52

ELECTRONIC BONUS PLATES

BP 41 Cervical Ribs and Related Variations

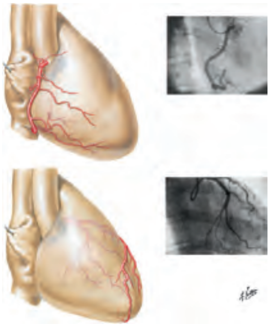
BP 42 Muscle Attachments of Ribs



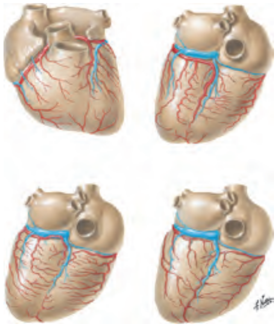
BP 43 Muscles of Respiration

BP 44 Intrapulmonary Airways: Schema

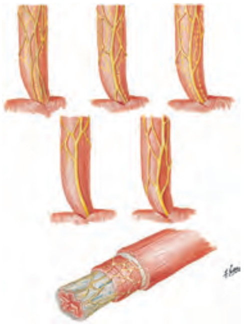
BP 45 Anatomy of Ventilation and Respiration



BP 46 Coronary Arteries: Right Anterolateral Views with Arteriograms

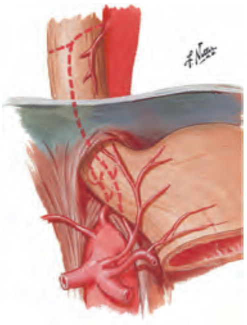


BP 47 Coronary Arteries and Cardiac Veins: Variations



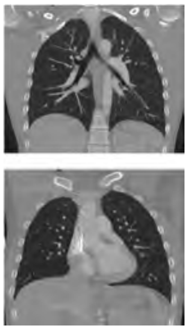
BP 48 Intrinsic Nerves and Variations in Nerves of Esophagus

ELECTRONIC BONUS PLATES—*cont'd*

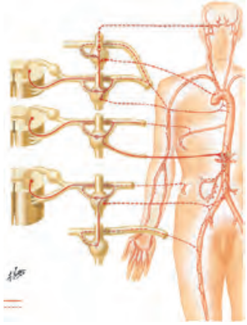


BP 49 Arteries of Esophagus: Variations

BP 50 Thorax: Coronal Section

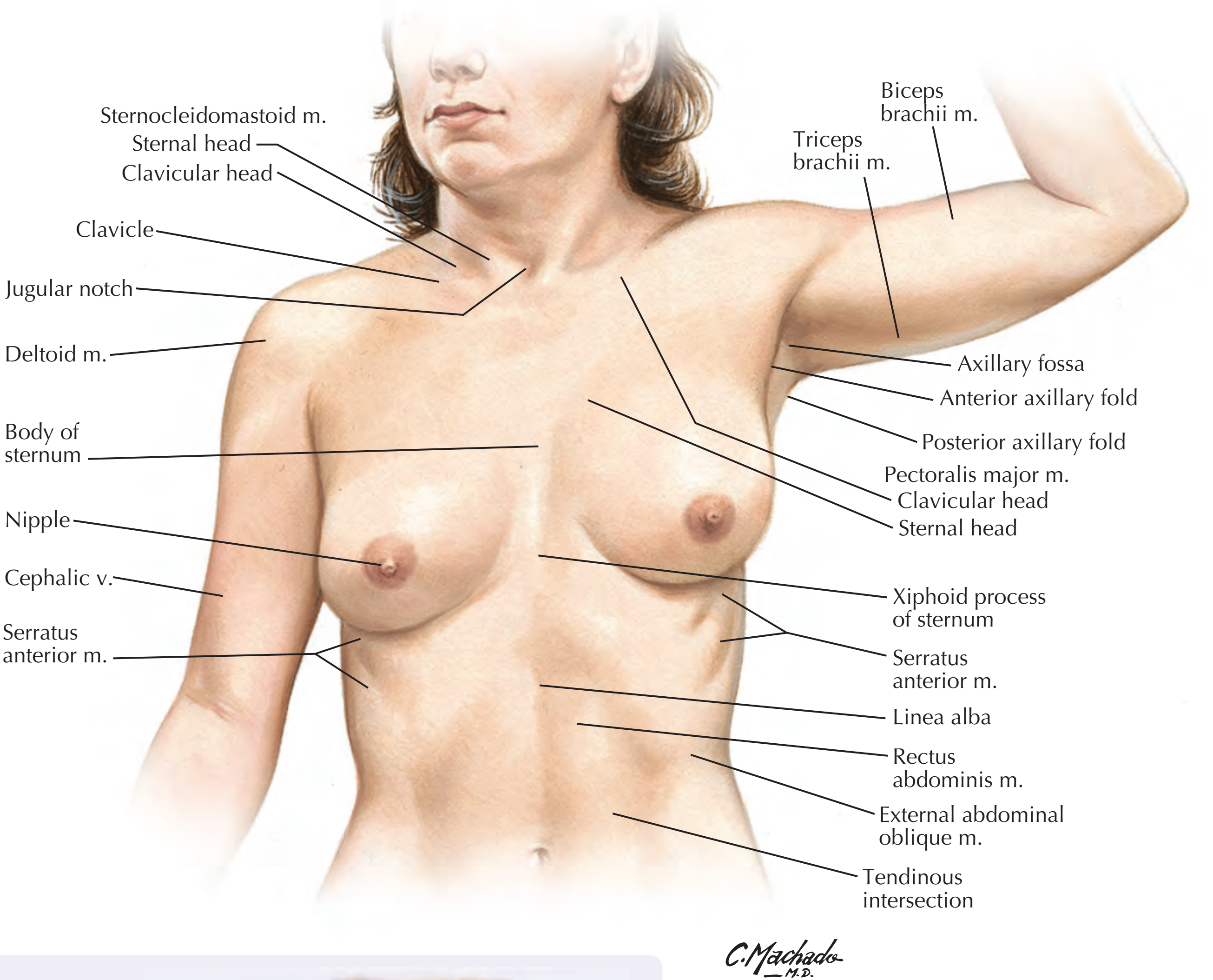


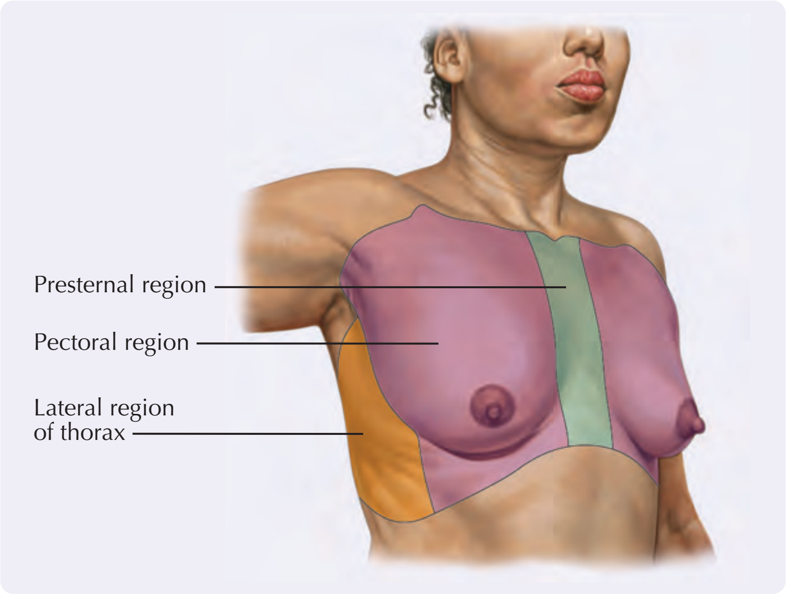
BP 51 Thorax: Coronal CTs



BP 52 Innervation of Blood Vessels: Schema

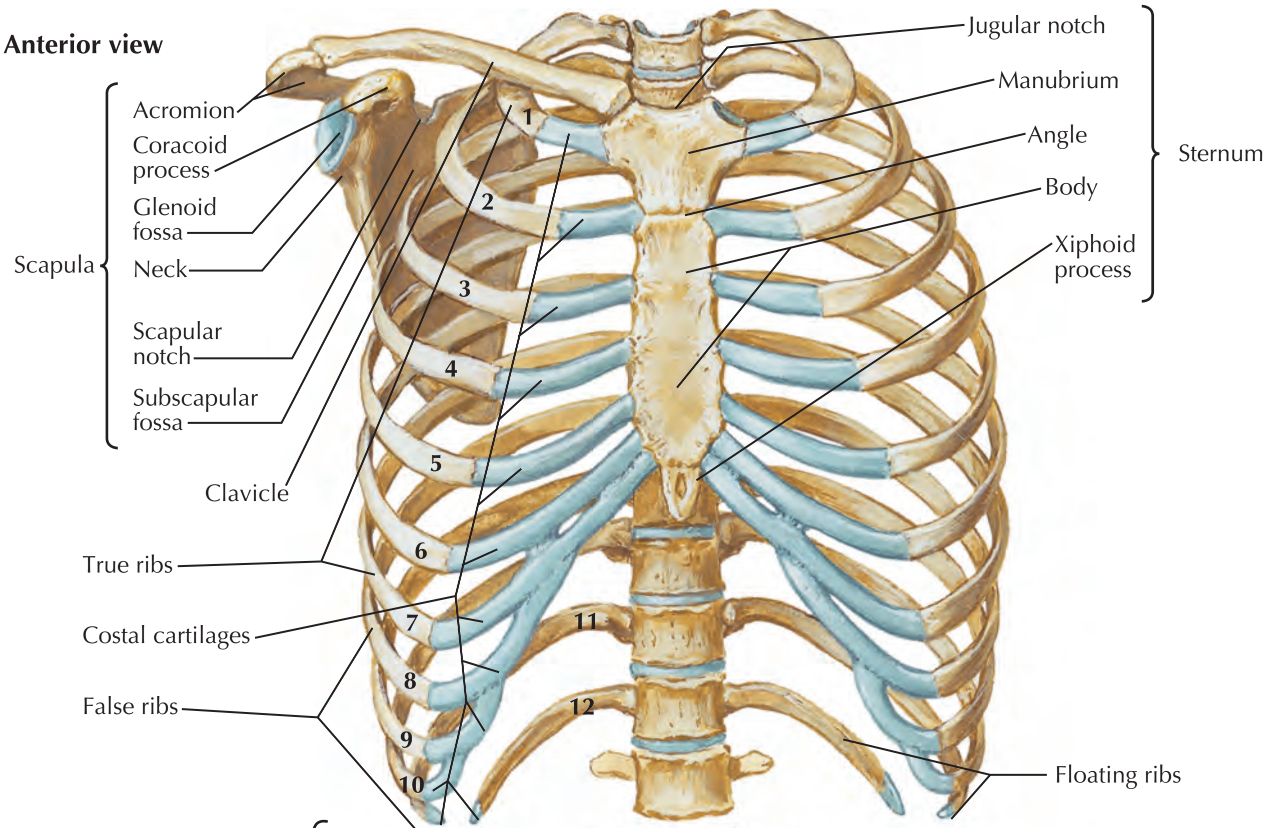
See also **Plates 188, 209**


Sternocleidomastoid m.
Sternal head
Clavicular head
Clavicle
Jugular notch
Deltoid m.
Body of sternum
Nipple
Cephalic v.
Serratus anterior m.
Biceps brachii m.
Triceps brachii m.
Axillary fossa
Anterior axillary fold
Posterior axillary fold
Pectoralis major m.
Clavicular head
Sternal head
Xiphoid process of sternum
Serratus anterior m.
Linea alba
Rectus abdominis m.
External abdominal oblique m.
Tendinous intersection
C. Machado M.D.

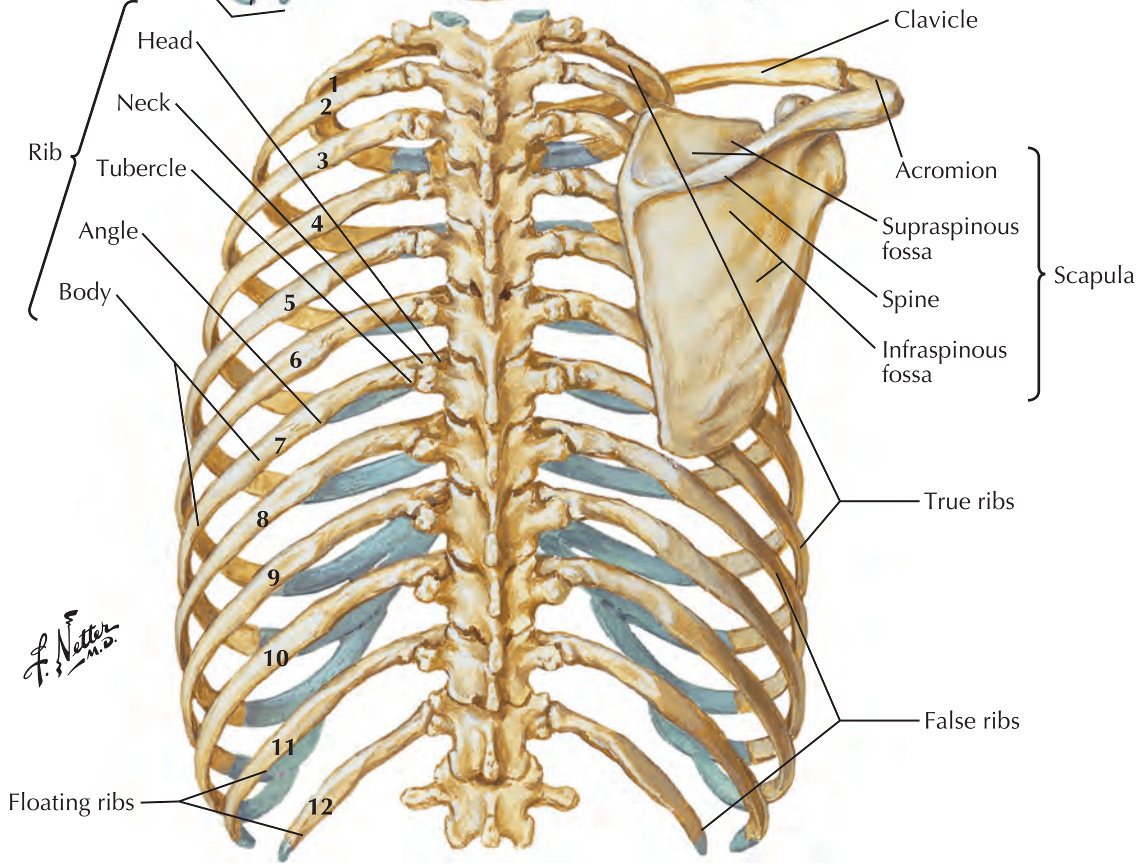

Presternal region
Pectoral region
Lateral region of thorax

Bony Framework of Thorax

Anterior view

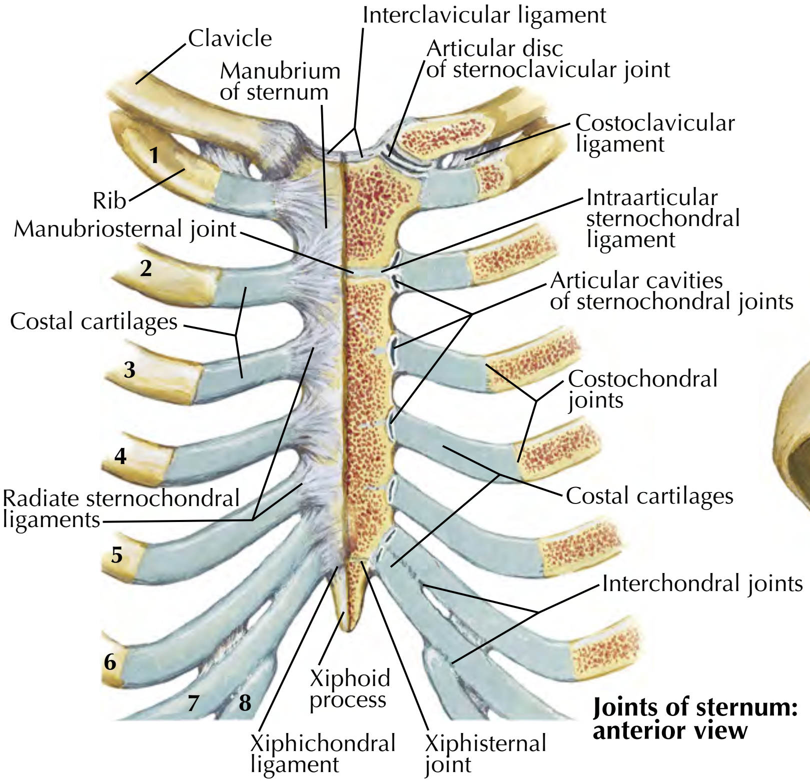

Acromion
Coracoid process
Glenoid fossa
Neck
Scapular notch
Subscapular fossa
Scapula
Clavicle
True ribs
Costal cartilages
False ribs
1
2
3
4
5
6
7
8
9
10
11
12
Jugular notch
Manubrium
Angle
Body
Xiphoid process
Sternum
Floating ribs

Posterior view


Head
Neck
Tubercle
Angle
Body
Rib
1
2
3
4
5
6
7
8
9
10
11
12
Floating ribs
Clavicle
Acromion
Supraspinous fossa
Spine
Infraspinous fossa
Scapula
True ribs
False ribs

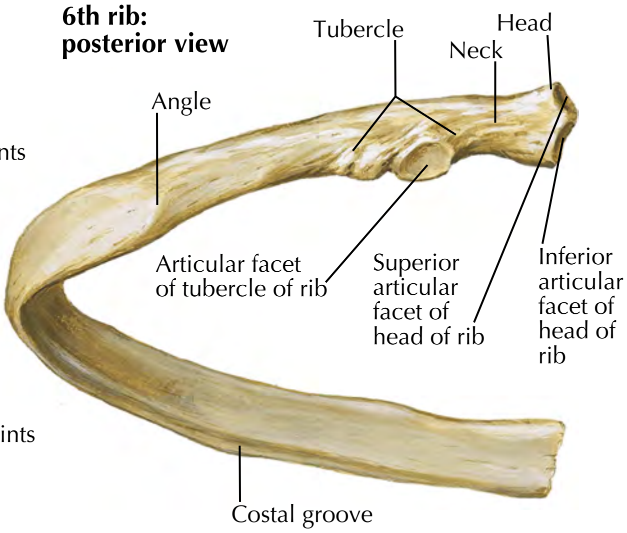
Ribs and Associated Joints

See also **Plates 188, 209, BP 33**

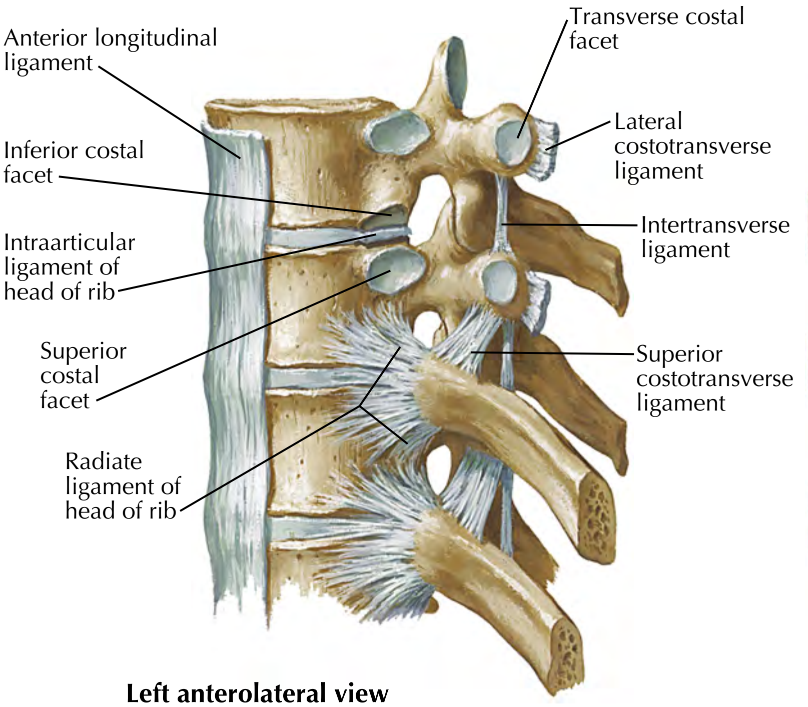

Interclavicular ligament
Clavicle
Manubrium of sternum
Articular disc of sternoclavicular joint
Costoclavicular ligament
1
Rib
Manubriosternal joint
Intraarticular sternochondral ligament
2
Articular cavities of sternochondral joints
Costal cartilages
3
Costochondral joints
4
Radiate sternochondral ligaments
Costal cartilages
5
Interchondral joints
6
7
8
Xiphoid process
Xiphichondral ligament
Xiphisternal joint

Joints of sternum: anterior view

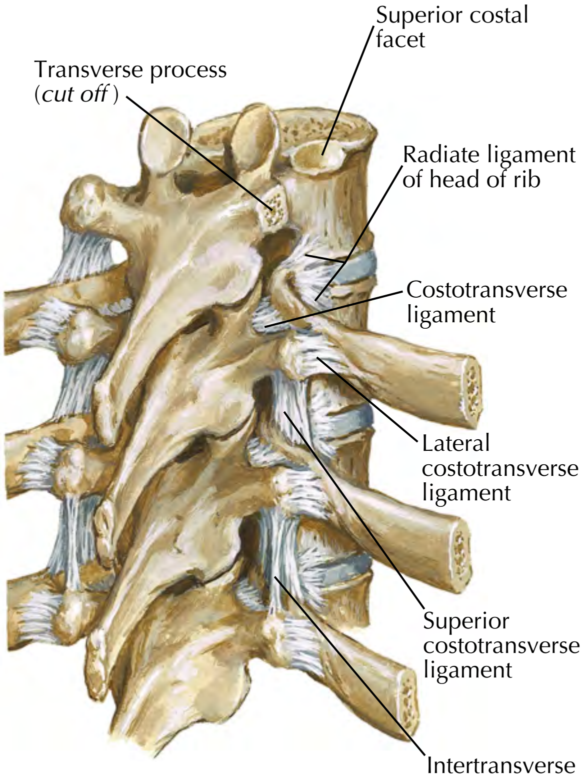
6th rib: posterior view


Tubercle
Head
Neck
Angle
Articular facet of tubercle of rib
Superior articular facet of head of rib
Inferior articular facet of head of rib
Costal groove

Note: The head of a typical rib articulates with the superior costal facet of the thoracic vertebra of the same number (by its inferior articular facet), the inferior costal facet of the vertebra above (by its superior articular facet), and the intervertebral disc between the two vertebrae. The costal tubercle articulates with the transverse process of the vertebra of the same number.

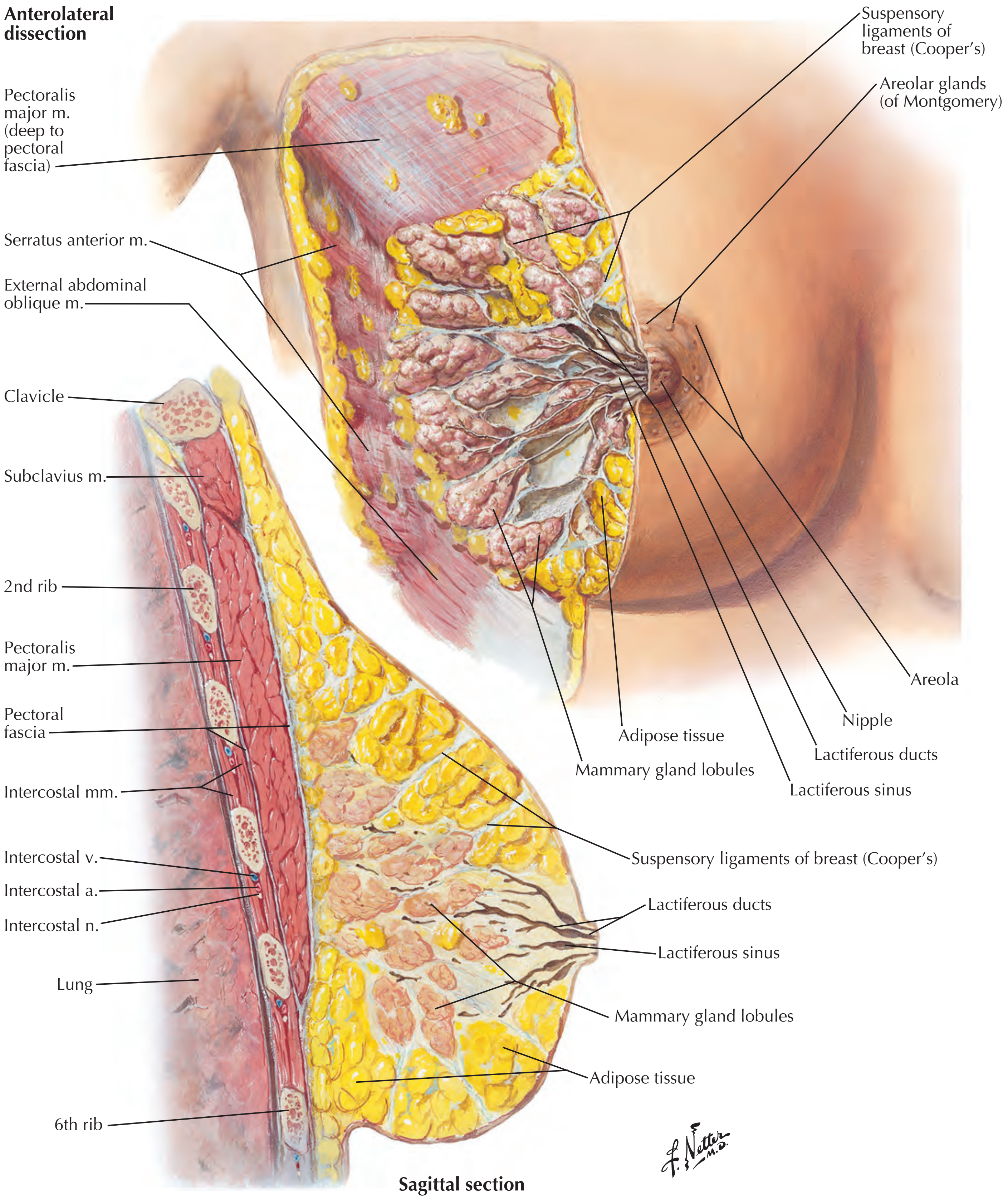

Anterior longitudinal ligament
Transverse costal facet
Lateral costotransverse ligament
Inferior costal facet
Intertransverse ligament
Intraarticular ligament of head of rib
Superior costal facet
Superior costotransverse ligament
Radiate ligament of head of rib

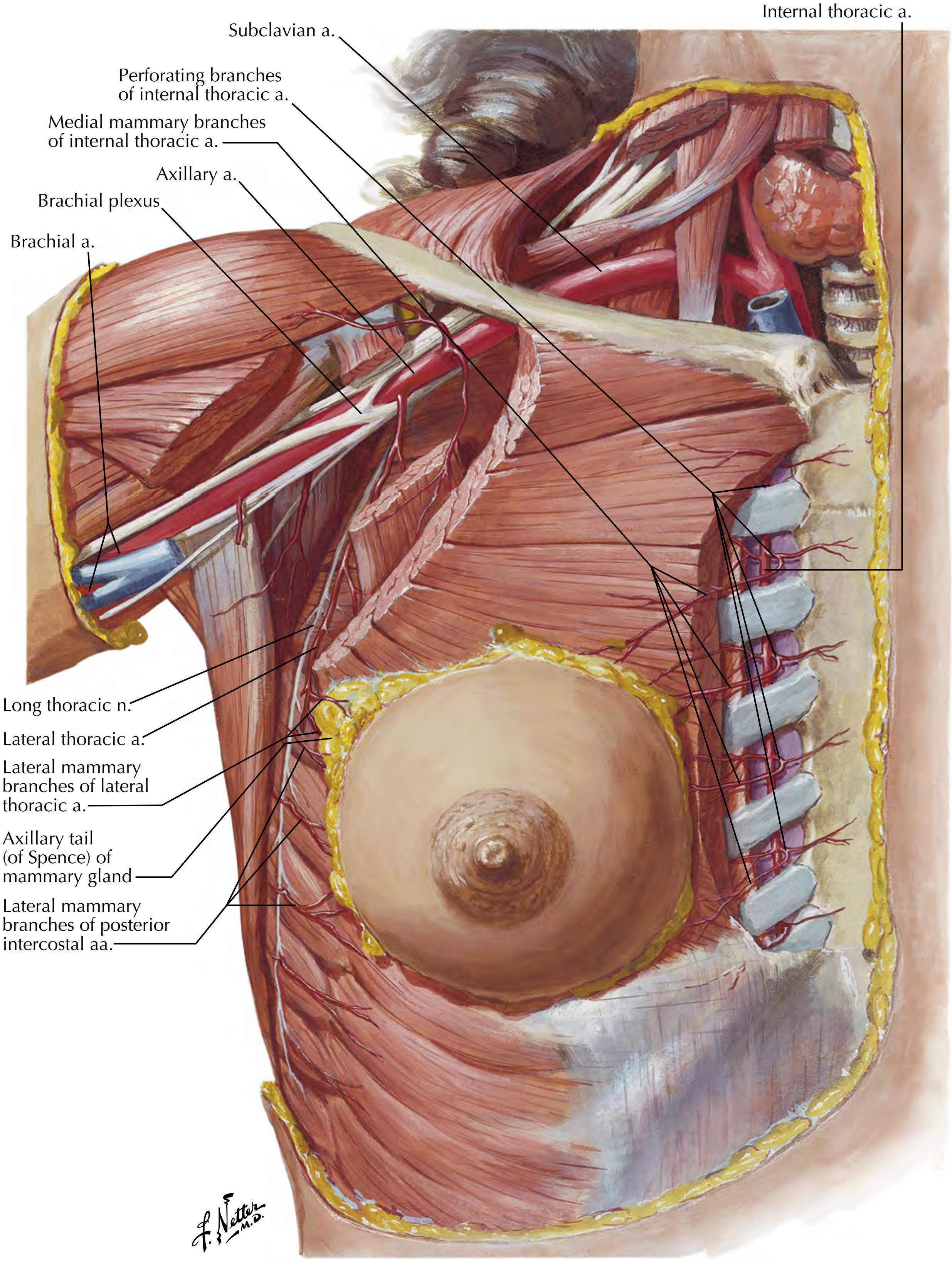
Left anterolateral view


Superior costal facet
Transverse process (*cut off*)
Radiate ligament of head of rib
Costotransverse ligament
Lateral costotransverse ligament
Superior costotransverse ligament
Intertransverse ligament

Right posterolateral view

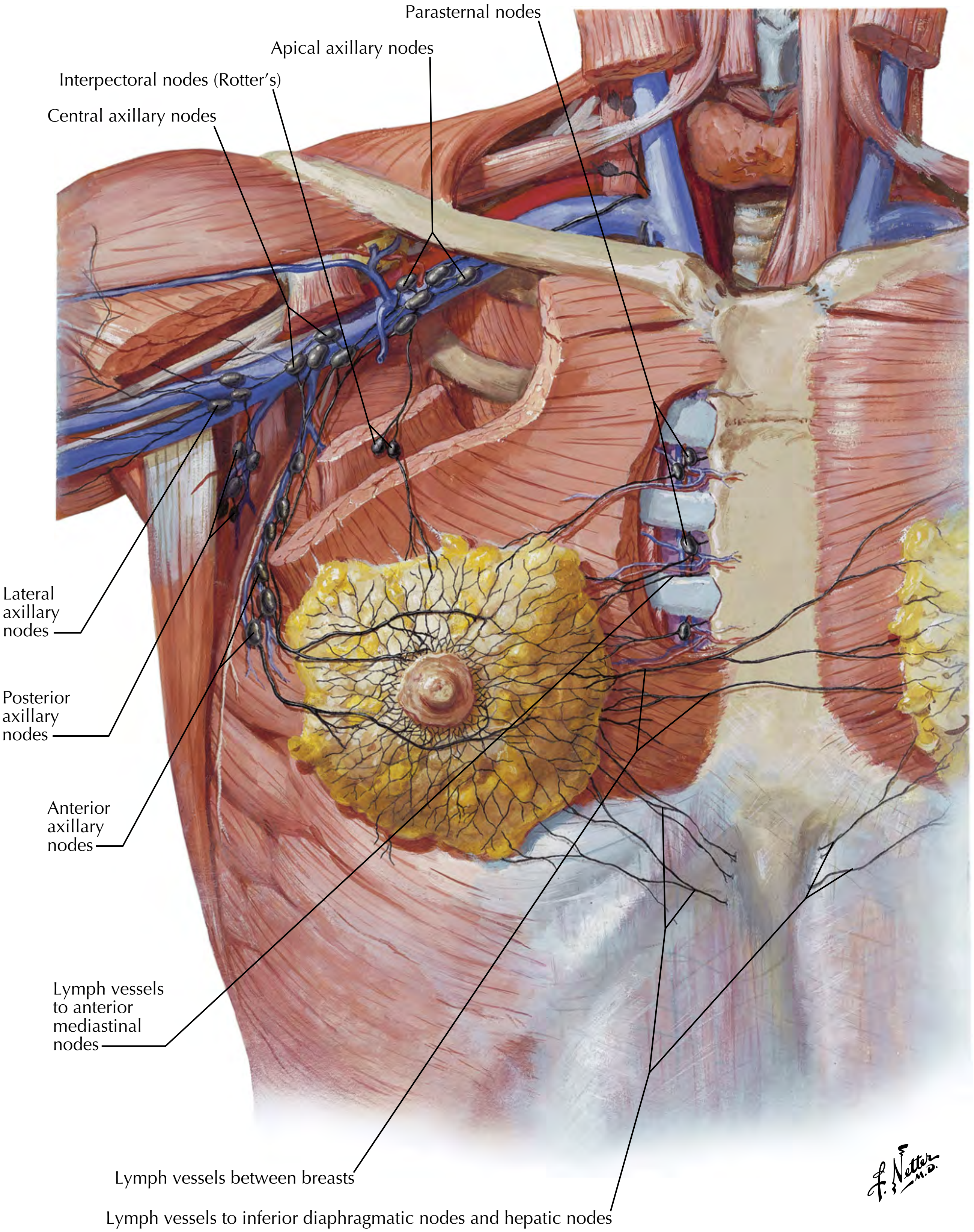
Mammary Glands


Anterolateral dissection
Pectoralis major m. (deep to pectoral fascia)
Serratus anterior m.
External abdominal oblique m.
Suspensory ligaments of breast (Cooper's)
Areolar glands (of Montgomery)
Areola
Nipple
Adipose tissue
Mammary gland lobules
Lactiferous ducts
Lactiferous sinus
Clavicle
Subclavius m.
2nd rib
Pectoralis major m.
Pectoral fascia
Intercostal mm.
Intercostal v.
Intercostal a.
Intercostal n.
Lung
6th rib
Suspensory ligaments of breast (Cooper's)
Lactiferous ducts
Lactiferous sinus
Mammary gland lobules
Adipose tissue
Sagittal section
F. Netter M.D.

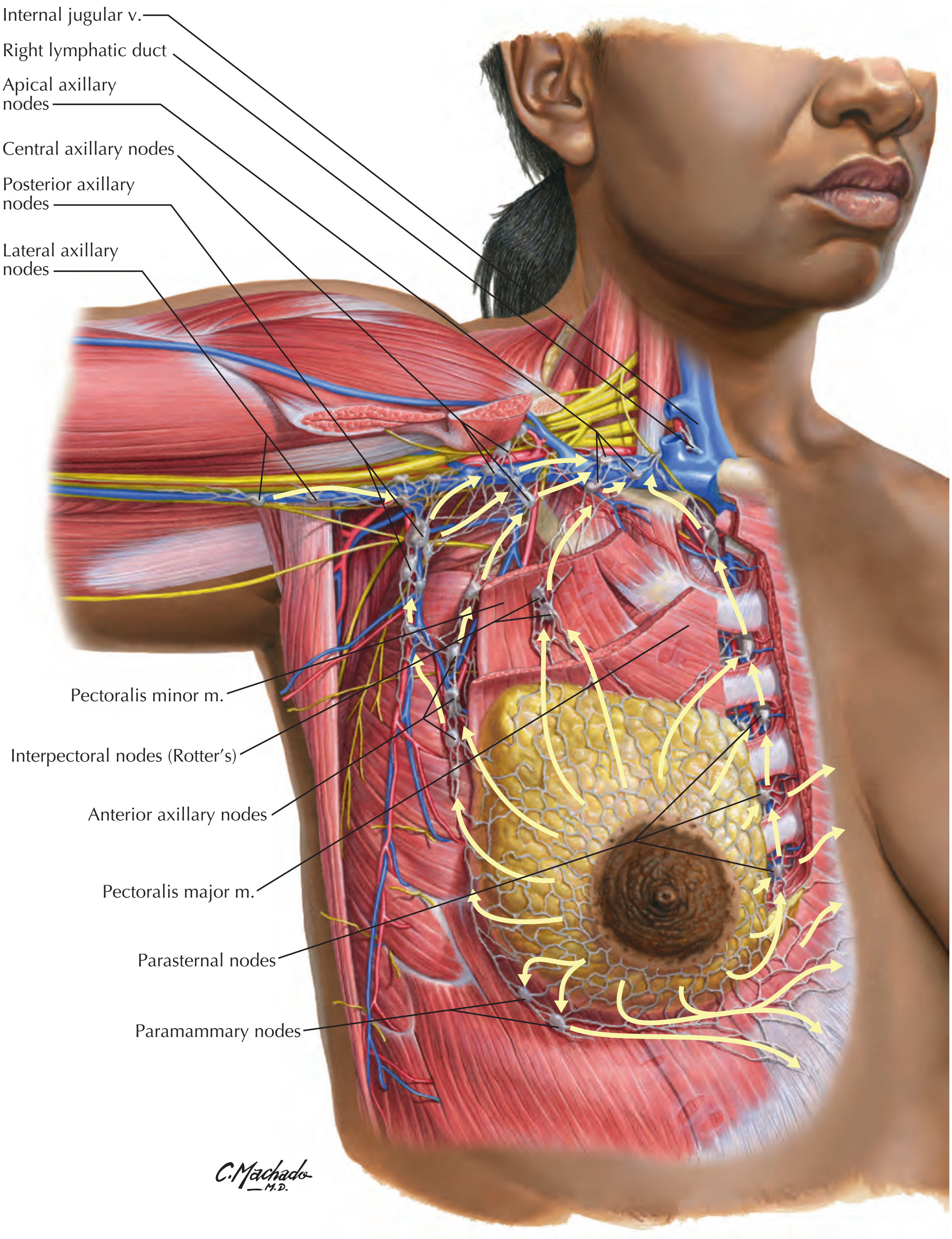

Subclavian a.
Perforating branches of internal thoracic a.
Medial mammary branches of internal thoracic a.
Axillary a.
Brachial plexus
Brachial a.
Internal thoracic a.
Long thoracic n.
Lateral thoracic a.
Lateral mammary branches of lateral thoracic a.
Axillary tail (of Spence) of mammary gland
Lateral mammary branches of posterior intercostal aa.
F. Netter M.D.

Lymph Vessels and Lymph Nodes of Breast

See also **Plate 208**

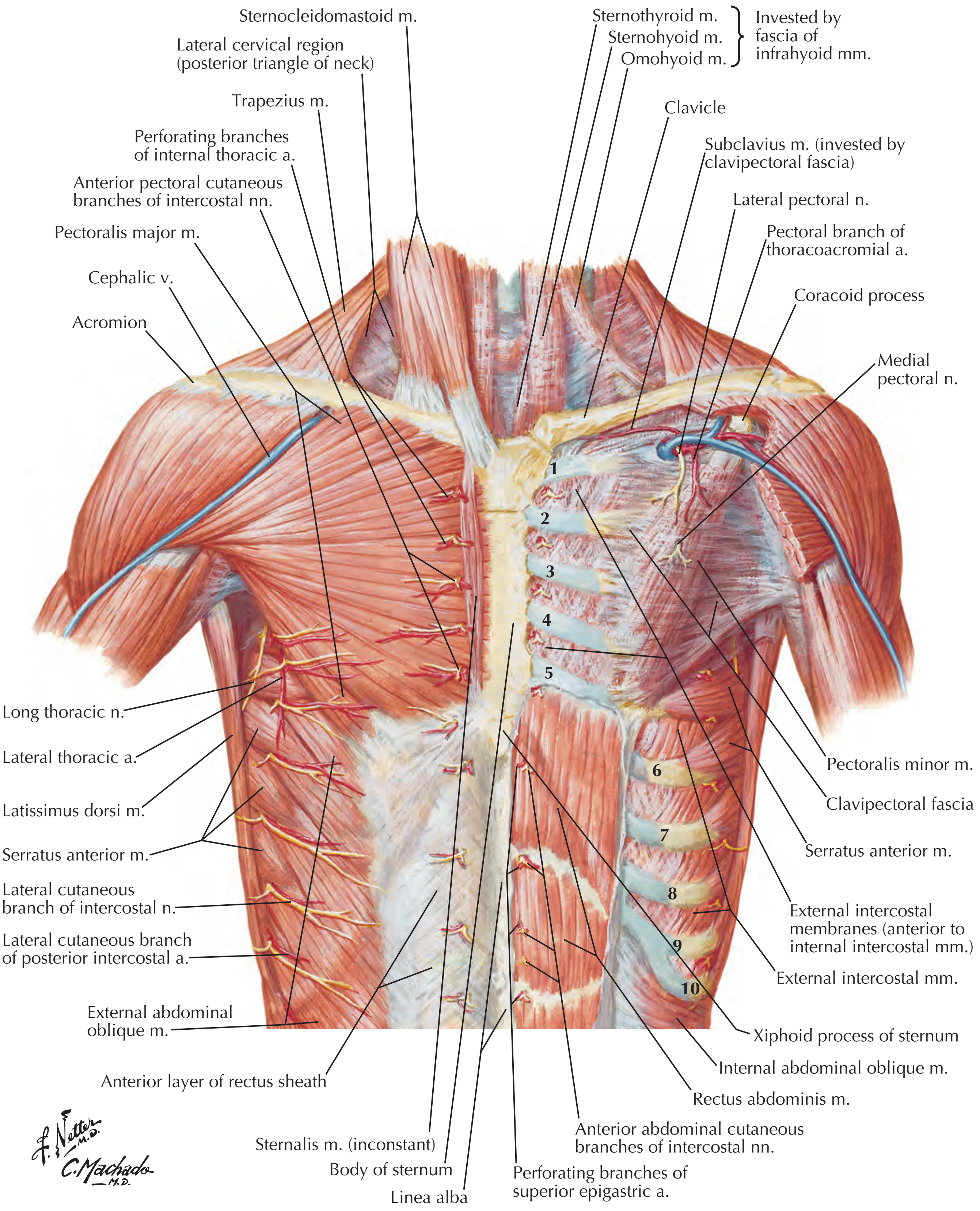

Parasternal nodes
Apical axillary nodes
Interpectoral nodes (Rotter's)
Central axillary nodes
Lateral axillary nodes
Posterior axillary nodes
Anterior axillary nodes
Lymph vessels to anterior mediastinal nodes
Lymph vessels between breasts
Lymph vessels to inferior diaphragmatic nodes and hepatic nodes

See also **Plate 207**

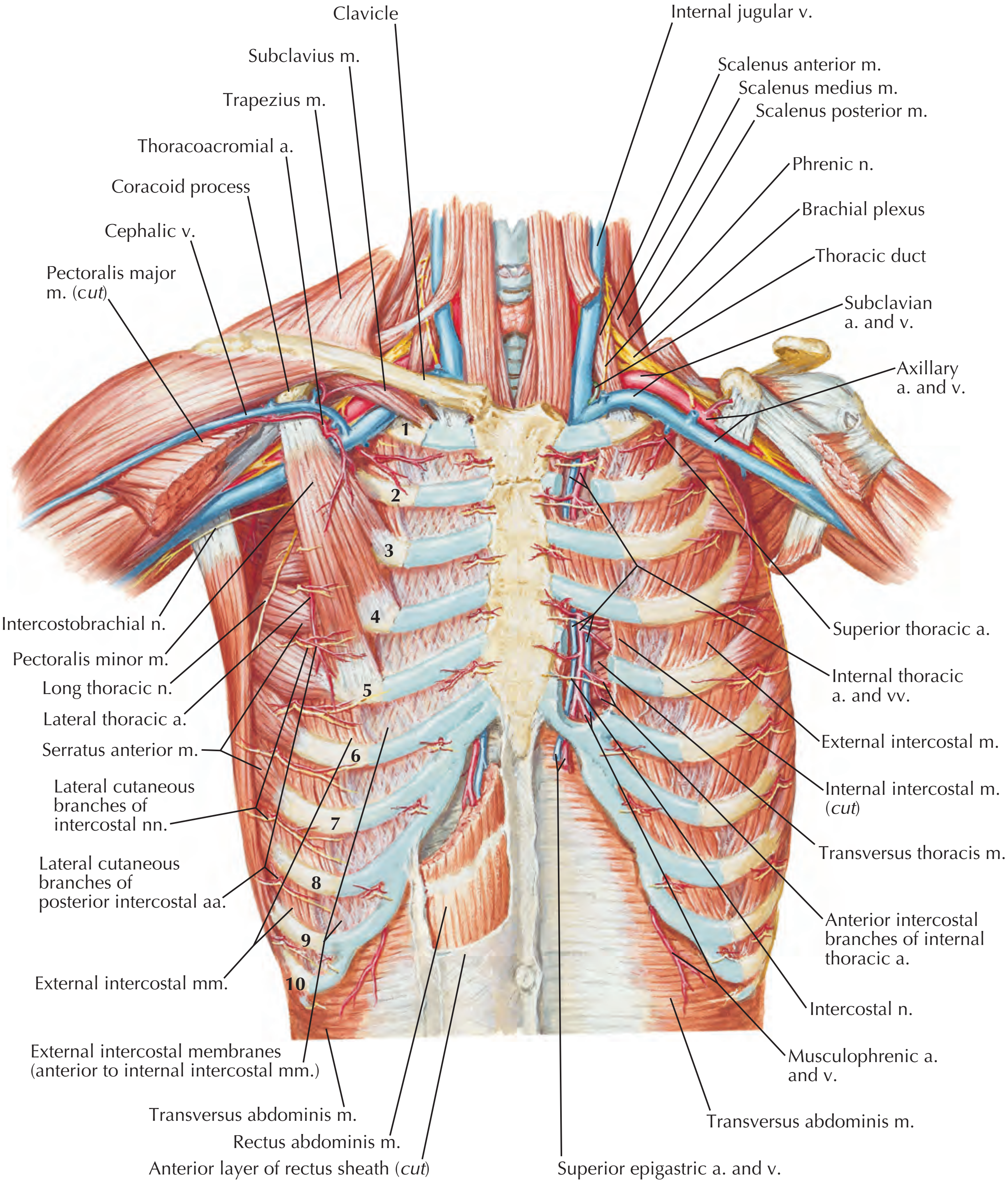

Internal jugular v.
Right lymphatic duct
Apical axillary nodes
Central axillary nodes
Posterior axillary nodes
Lateral axillary nodes
Pectoralis minor m.
Interpectoral nodes (Rotter's)
Anterior axillary nodes
Pectoralis major m.
Parasternal nodes
Paramammary nodes
C.Machado M.D.

Anterior Thoracic Wall: Superficial Dissection

See also **Plates BP 42, BP 43**


Sternocleidomastoid m.
Lateral cervical region (posterior triangle of neck)
Trapezius m.
Perforating branches of internal thoracic a.
Anterior pectoral cutaneous branches of intercostal nn.
Pectoralis major m.
Cephalic v.
Acromion
Sternothyroid m.
Sternohyoid m.
Omohyoid m.
Invested by fascia of infrahyoid mm.
Clavicle
Subclavius m. (invested by clavipectoral fascia)
Lateral pectoral n.
Pectoral branch of thoracoacromial a.
Coracoid process
Medial pectoral n.
1
2
3
4
5
6
7
8
9
10
Long thoracic n.
Lateral thoracic a.
Latissimus dorsi m.
Serratus anterior m.
Lateral cutaneous branch of intercostal n.
Lateral cutaneous branch of posterior intercostal a.
External abdominal oblique m.
Anterior layer of rectus sheath
Sternalis m. (inconstant)
Body of sternum
Linea alba
Perforating branches of superior epigastric a.
Anterior abdominal cutaneous branches of intercostal nn.
Rectus abdominis m.
Internal abdominal oblique m.
Xiphoid process of sternum
External intercostal mm.
External intercostal membranes (anterior to internal intercostal mm.)
Serratus anterior m.
Clavipectoral fascia
Pectoralis minor m.
F. Netter M.D.
C. Machado M.D.

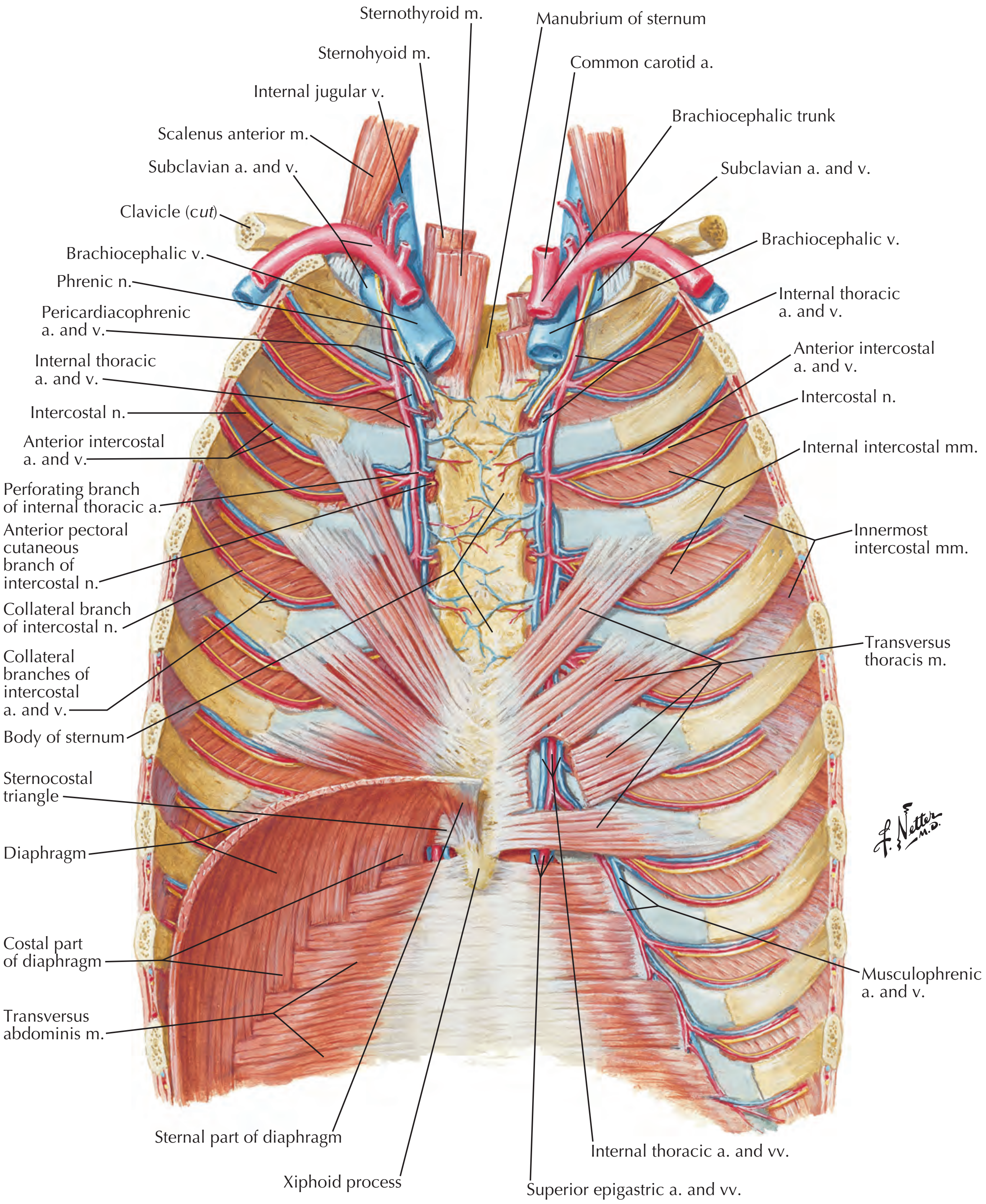
See also **Plates BP 41, BP 42**


Clavicle
Subclavius m.
Trapezius m.
Thoracoacromial a.
Coracoid process
Cephalic v.
Pectoralis major m. (*cut*)
Internal jugular v.
Scalenus anterior m.
Scalenus medius m.
Scalenus posterior m.
Phrenic n.
Brachial plexus
Thoracic duct
Subclavian a. and v.
Axillary a. and v.
1
2
3
4
5
6
7
8
9
10
Intercostobrachial n.
Pectoralis minor m.
Long thoracic n.
Lateral thoracic a.
Serratus anterior m.
Lateral cutaneous branches of intercostal nn.
Lateral cutaneous branches of posterior intercostal aa.
External intercostal mm.
External intercostal membranes (anterior to internal intercostal mm.)
Transversus abdominis m.
Rectus abdominis m.
Anterior layer of rectus sheath (*cut*)
Superior thoracic a.
Internal thoracic a. and vv.
External intercostal m.
Internal intercostal m. (*cut*)
Transversus thoracis m.
Anterior intercostal branches of internal thoracic a.
Intercostal n.
Musculophrenic a. and v.
Transversus abdominis m.
Superior epigastric a. and v.

F. Netter M.D.

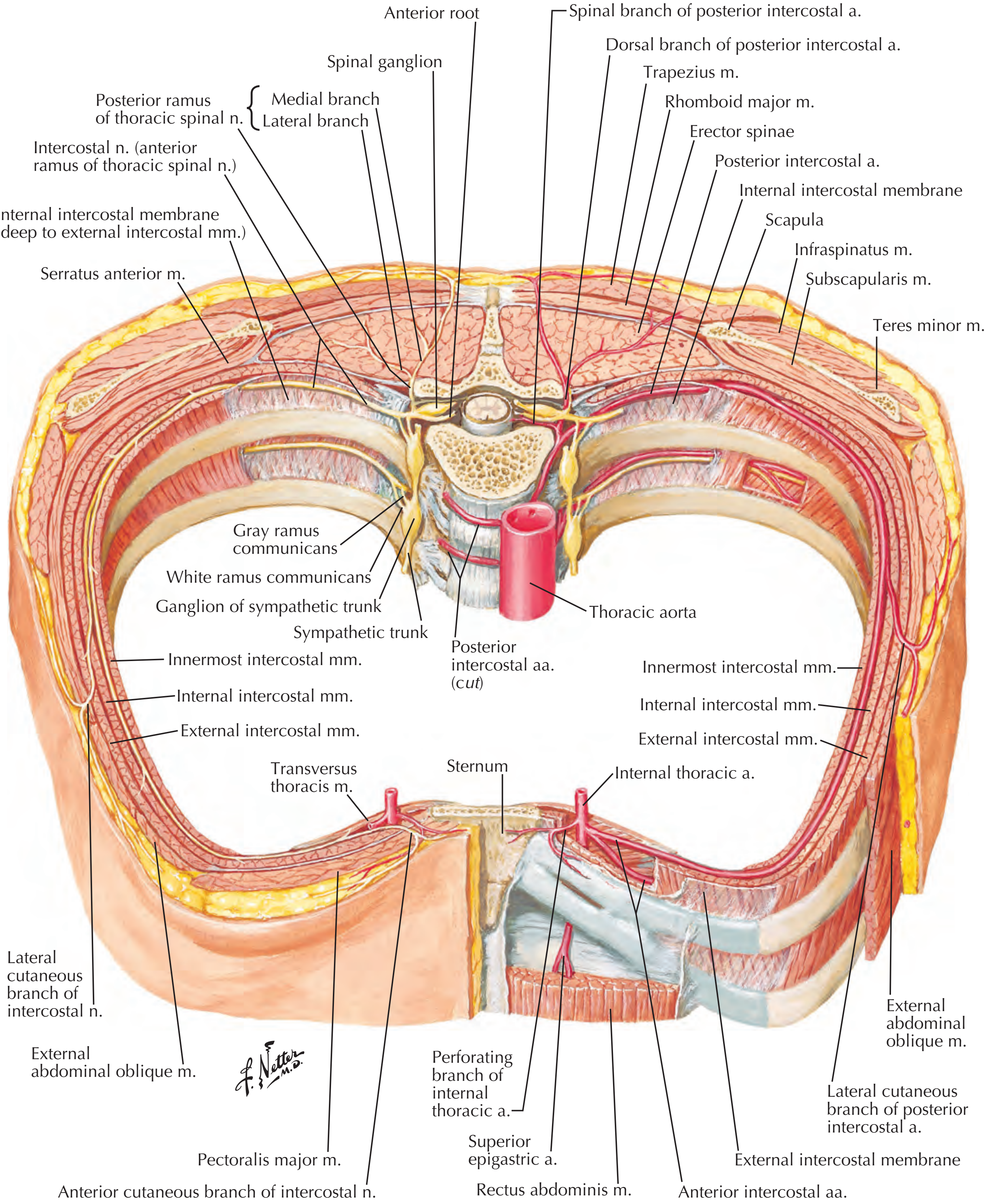
Anterior Thoracic Wall: Internal View

See also **Plate BP 42**


Sternothyroid m.
Manubrium of sternum
Sternohyoid m.
Common carotid a.
Internal jugular v.
Brachiocephalic trunk
Scalenus anterior m.
Subclavian a. and v.
Subclavian a. and v.
Clavicle (*cut*)
Brachiocephalic v.
Brachiocephalic v.
Phrenic n.
Internal thoracic a. and v.
Pericardiacophrenic a. and v.
Anterior intercostal a. and v.
Internal thoracic a. and v.
Intercostal n.
Intercostal n.
Internal intercostal mm.
Anterior intercostal a. and v.
Perforating branch of internal thoracic a.
Innermost intercostal mm.
Anterior pectoral cutaneous branch of intercostal n.
Collateral branch of intercostal n.
Transversus thoracis m.
Collateral branches of intercostal a. and v.
Body of sternum
Sternocostal triangle
Diaphragm
Costal part of diaphragm
Musculophrenic a. and v.
Transversus abdominis m.
Sternal part of diaphragm
Internal thoracic a. and vv.
Xiphoid process
Superior epigastric a. and vv.

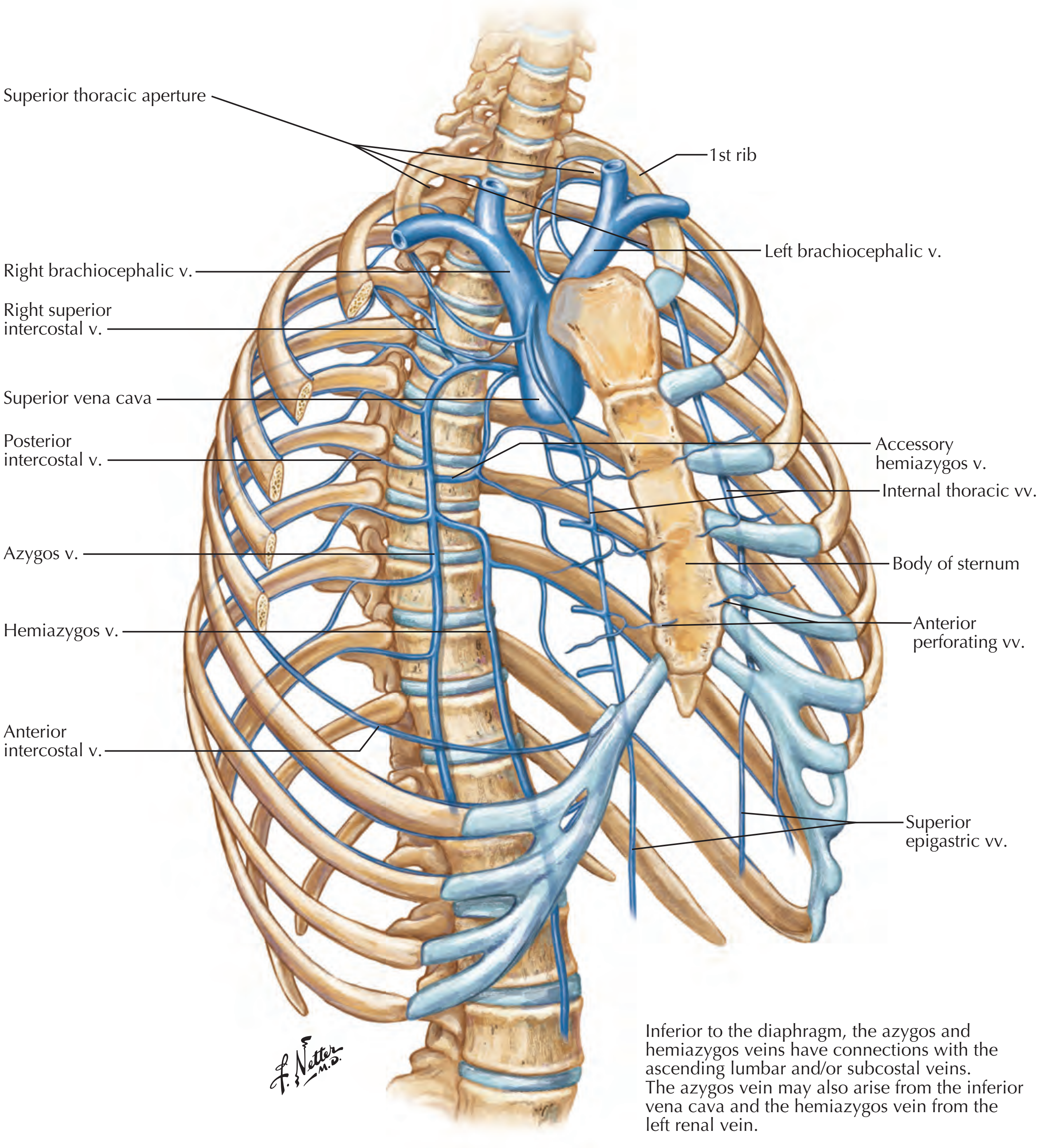
Intercostal Nerves and Arteries

See also **Plates 279, 287**


Anterior root
Spinal ganglion
Posterior ramus of thoracic spinal n.
Medial branch
Lateral branch
Intercostal n. (anterior ramus of thoracic spinal n.)
Internal intercostal membrane (deep to external intercostal mm.)
Serratus anterior m.
Spinal branch of posterior intercostal a.
Dorsal branch of posterior intercostal a.
Trapezius m.
Rhomboid major m.
Erector spinae
Posterior intercostal a.
Internal intercostal membrane
Scapula
Infraspinatus m.
Subscapularis m.
Teres minor m.
Gray ramus communicans
White ramus communicans
Ganglion of sympathetic trunk
Sympathetic trunk
Thoracic aorta
Posterior intercostal aa. (*cut*)
Innermost intercostal mm.
Internal intercostal mm.
External intercostal mm.
Innermost intercostal mm.
Internal intercostal mm.
External intercostal mm.
Transversus thoracis m.
Sternum
Internal thoracic a.
Lateral cutaneous branch of intercostal n.
External abdominal oblique m.
F. Netter M.D.
Perforating branch of internal thoracic a.
Superior epigastric a.
Pectoralis major m.
Anterior cutaneous branch of intercostal n.
Rectus abdominis m.
Anterior intercostal aa.
External intercostal membrane
Lateral cutaneous branch of posterior intercostal a.
External abdominal oblique m.

Veins of Thoracic Wall

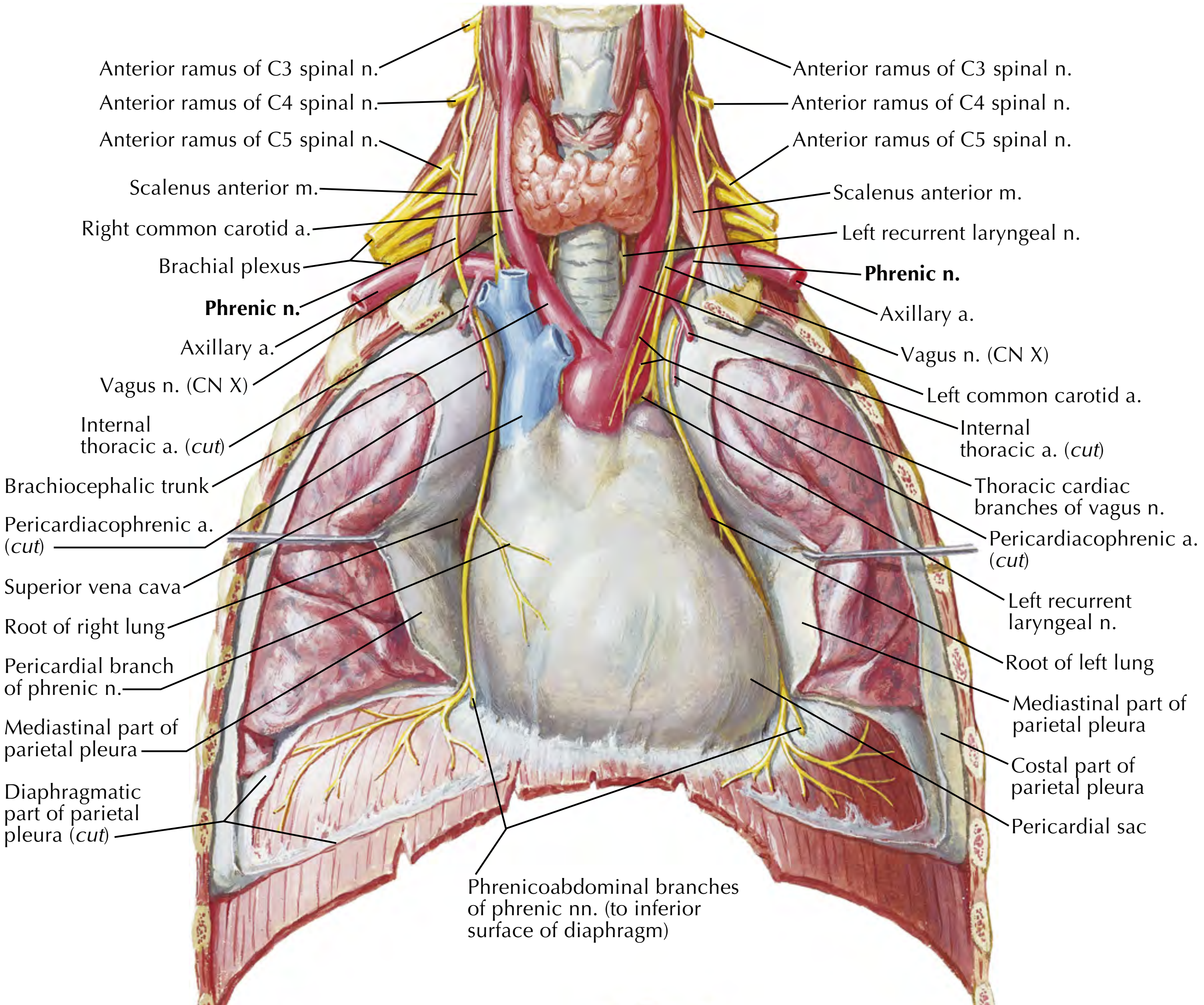
See also **Plates 234, 259, 277**

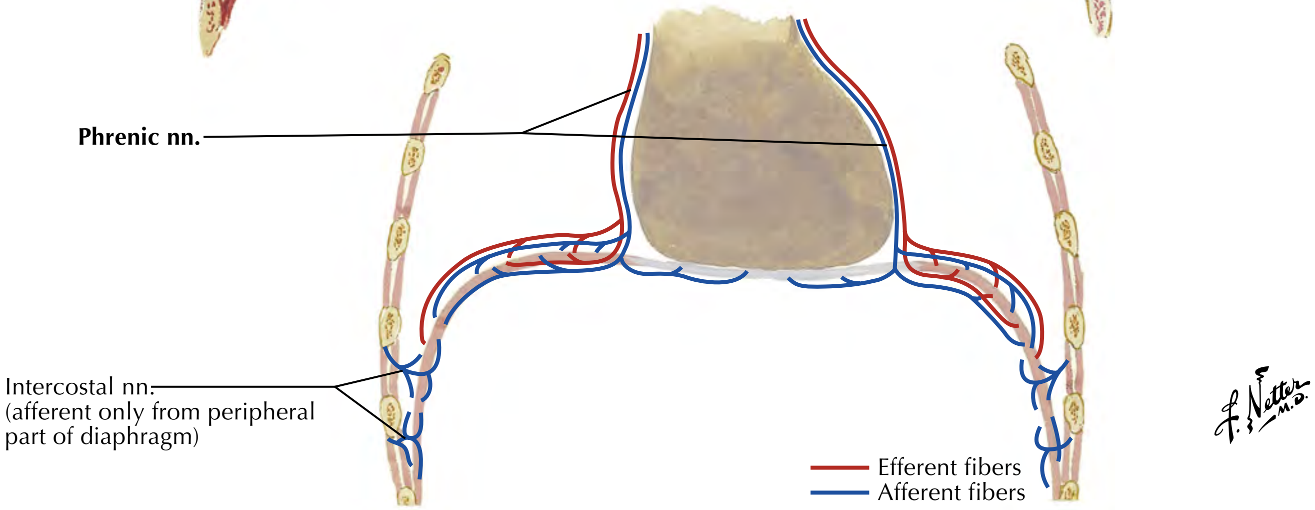

Superior thoracic aperture
1st rib
Left brachiocephalic v.
Right brachiocephalic v.
Right superior intercostal v.
Superior vena cava
Posterior intercostal v.
Accessory hemiazygos v.
Internal thoracic vv.
Azygos v.
Body of sternum
Hemiazygos v.
Anterior perforating vv.
Anterior intercostal v.
Superior epigastric vv.

Inferior to the diaphragm, the azygos and hemiazygos veins have connections with the ascending lumbar and/or subcostal veins. The azygos vein may also arise from the inferior vena cava and the hemiazygos vein from the left renal vein.

Phrenic Nerve and Relationship to Pericardium

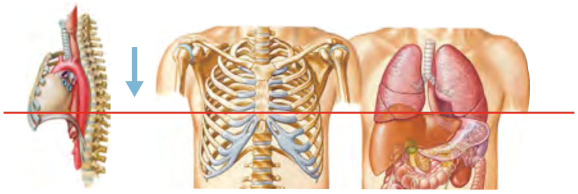
See also **Plates 56, 103**

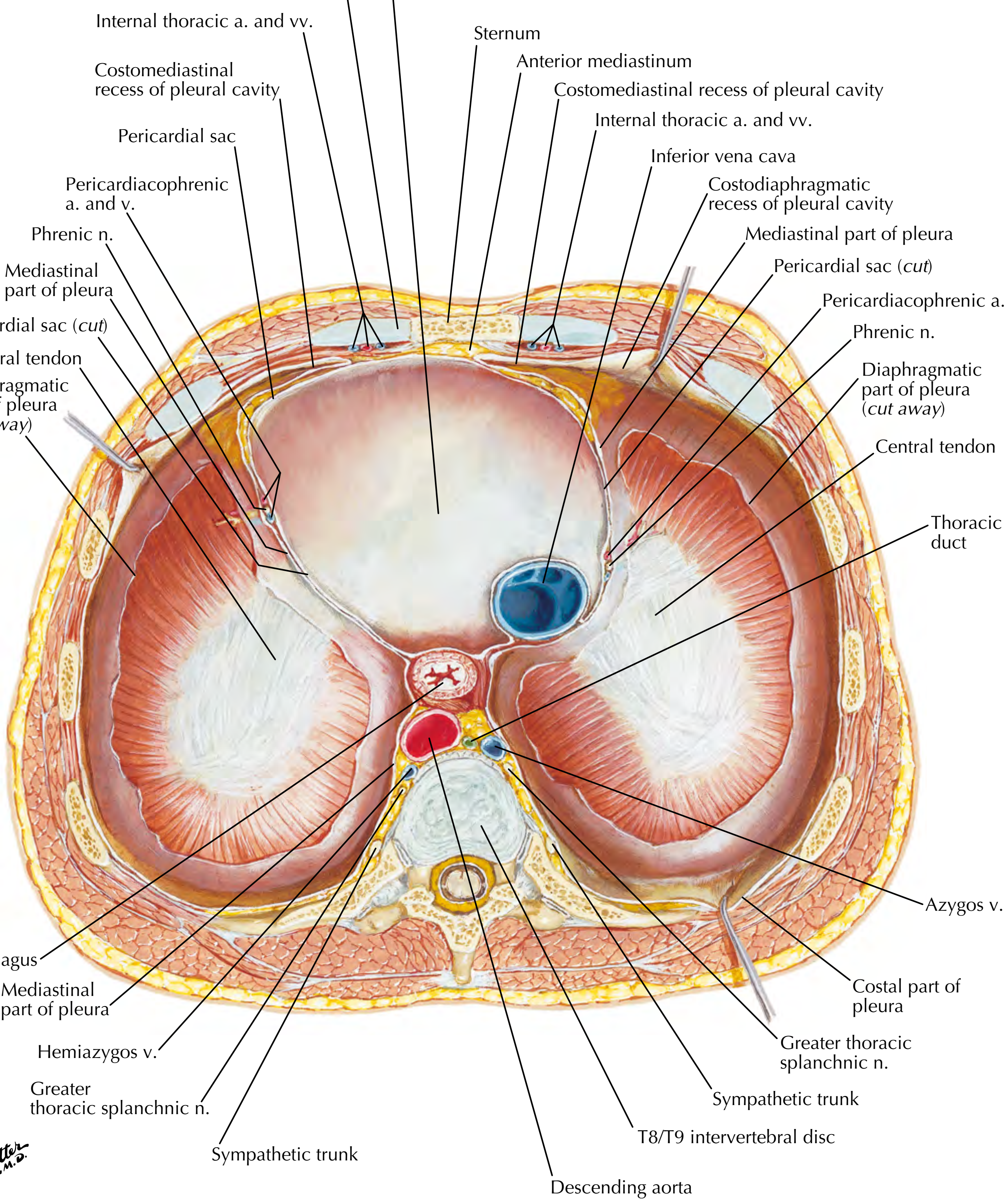

Anterior ramus of C3 spinal n.
Anterior ramus of C4 spinal n.
Anterior ramus of C5 spinal n.
Scalenus anterior m.
Right common carotid a.
Brachial plexus
Phrenic n.
Axillary a.
Vagus n. (CN X)
Internal thoracic a. (*cut*)
Brachiocephalic trunk
Pericardiacophrenic a. (*cut*)
Superior vena cava
Root of right lung
Pericardial branch of phrenic n.
Mediastinal part of parietal pleura
Diaphragmatic part of parietal pleura (*cut*)
Phrenicoabdominal branches of phrenic nn. (to inferior surface of diaphragm)
Anterior ramus of C3 spinal n.
Anterior ramus of C4 spinal n.
Anterior ramus of C5 spinal n.
Scalenus anterior m.
Left recurrent laryngeal n.
Phrenic n.
Axillary a.
Vagus n. (CN X)
Left common carotid a.
Internal thoracic a. (*cut*)
Thoracic cardiac branches of vagus n.
Pericardiacophrenic a. (*cut*)
Left recurrent laryngeal n.
Root of left lung
Mediastinal part of parietal pleura
Costal part of parietal pleura
Pericardial sac


Phrenic nn.
Intercostal nn. (afferent only from peripheral part of diaphragm)
Efferent fibers
Afferent fibers
F. Netter M.D.

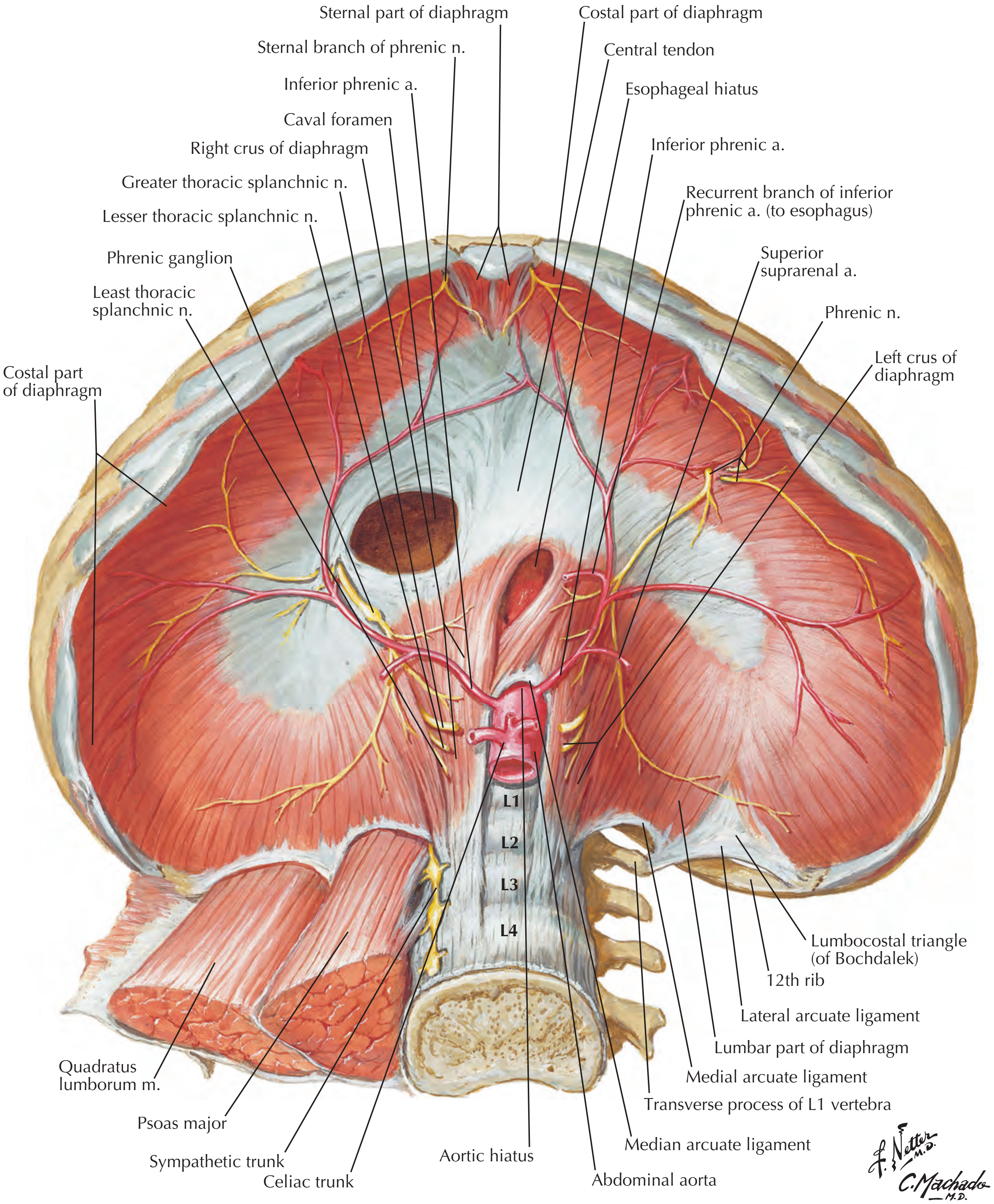
Diaphragm: Thoracic Surface

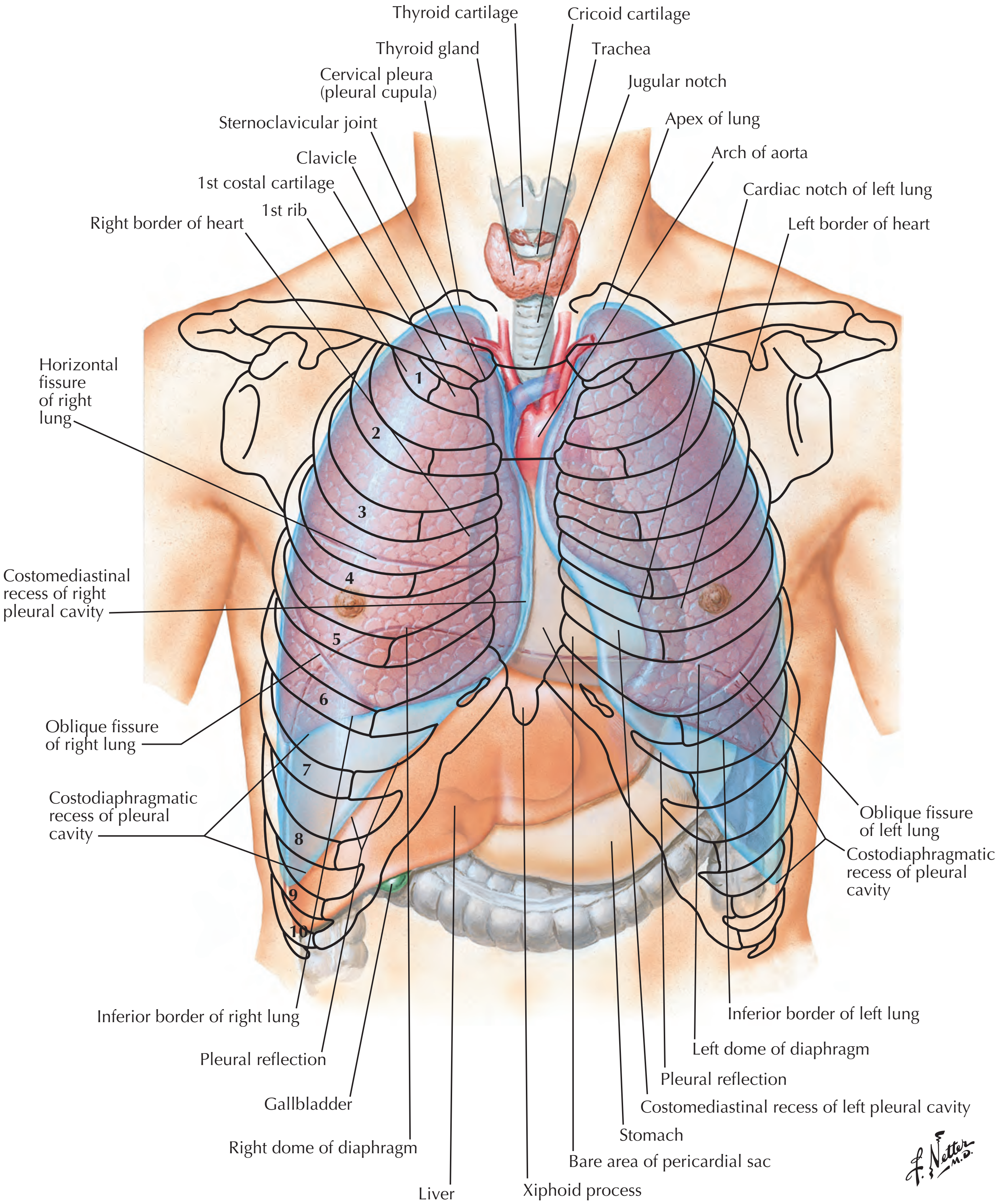
See also **Plates 253, 254**

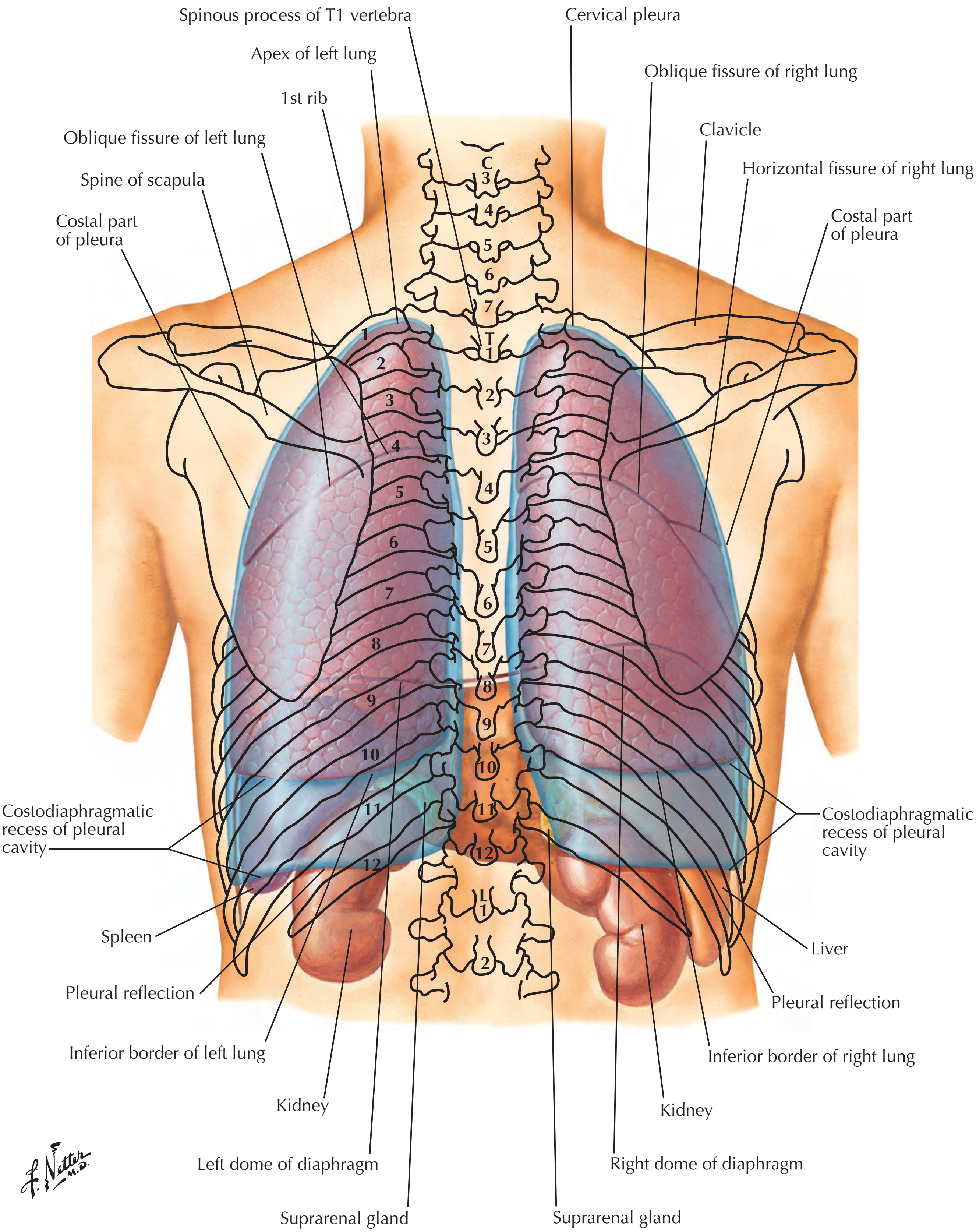



Central tendon (covered by pericardium)
5th costal cartilage
Internal thoracic a. and vv.
Costomediastinal recess of pleural cavity
Pericardial sac
Pericardiacophrenic a. and v.
Phrenic n.
Mediastinal part of pleura
Pericardial sac (*cut*)
Central tendon
Diaphragmatic part of pleura (*cut away*)
Sternum
Anterior mediastinum
Costomediastinal recess of pleural cavity
Internal thoracic a. and vv.
Inferior vena cava
Costodiaphragmatic recess of pleural cavity
Mediastinal part of pleura
Pericardial sac (*cut*)
Pericardiacophrenic a.
Phrenic n.
Diaphragmatic part of pleura (*cut away*)
Central tendon
Thoracic duct
Azygos v.
Costal part of pleura
Greater thoracic splanchnic n.
Sympathetic trunk
T8/T9 intervertebral disc
Descending aorta
Sympathetic trunk
Greater thoracic splanchnic n.
Hemiazygos v.
Mediastinal part of pleura
Esophagus

See also **Plates 283, 284**

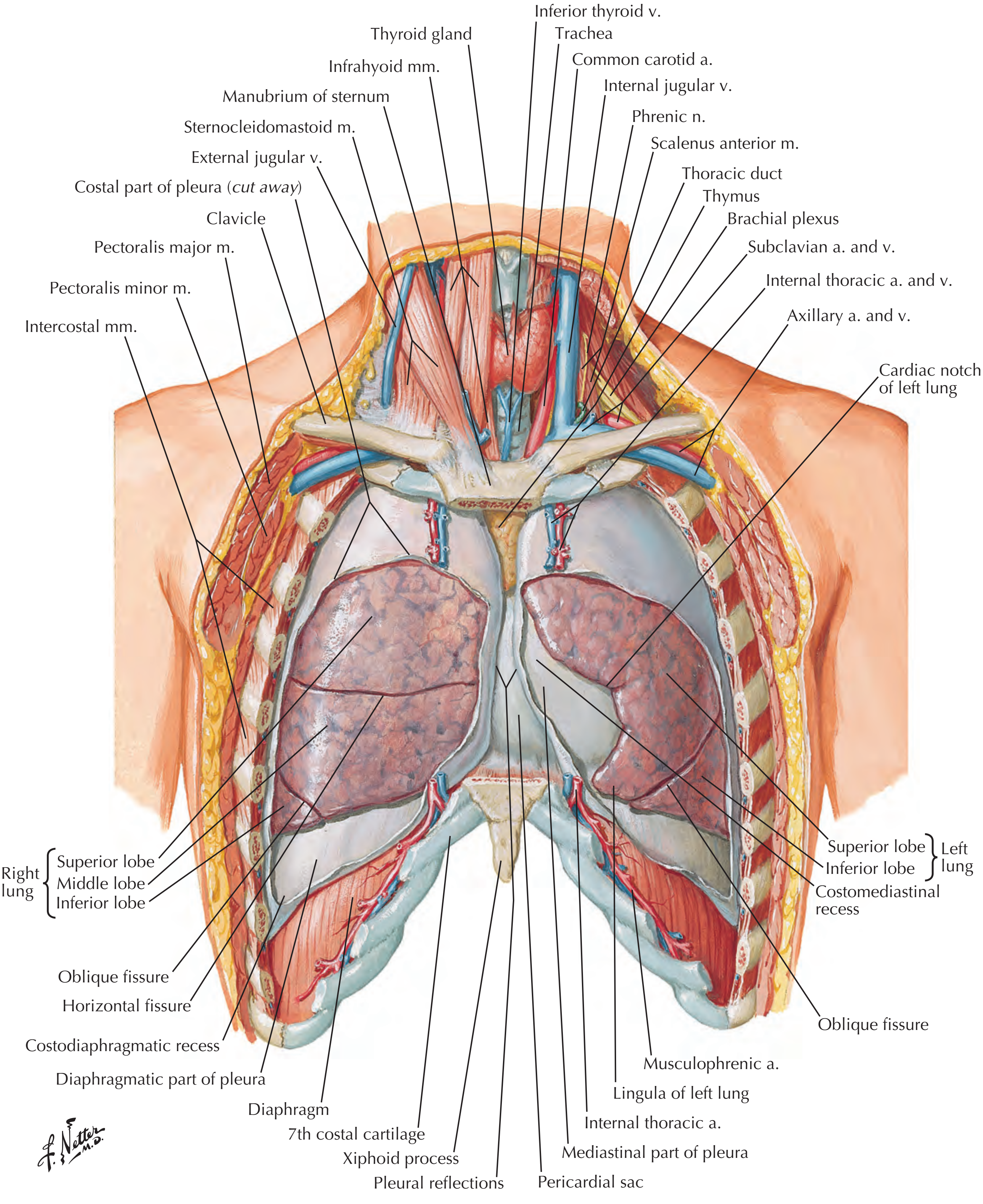

Sternal part of diaphragm
Sternal branch of phrenic n.
Inferior phrenic a.
Caval foramen
Right crus of diaphragm
Greater thoracic splanchnic n.
Lesser thoracic splanchnic n.
Phrenic ganglion
Least thoracic splanchnic n.
Costal part of diaphragm
Costal part of diaphragm
Central tendon
Esophageal hiatus
Inferior phrenic a.
Recurrent branch of inferior phrenic a. (to esophagus)
Superior suprarenal a.
Phrenic n.
Left crus of diaphragm
L1
L2
L3
L4
Lumbocostal triangle (of Bochdalek)
12th rib
Lateral arcuate ligament
Lumbar part of diaphragm
Medial arcuate ligament
Transverse process of L1 vertebra
Median arcuate ligament
Abdominal aorta
Aortic hiatus
Celiac trunk
Sympathetic trunk
Psoas major
Quadratus lumborum m.
F. Netter M.D.
C. Machado M.D.


Thyroid cartilage
Cricoid cartilage
Thyroid gland
Trachea
Cervical pleura (pleural cupula)
Jugular notch
Sternoclavicular joint
Apex of lung
Clavicle
Arch of aorta
1st costal cartilage
Cardiac notch of left lung
1st rib
Right border of heart
Left border of heart
Horizontal fissure of right lung
1
2
3
4
5
6
7
8
9
10
Costomediastinal recess of right pleural cavity
Oblique fissure of right lung
Costodiaphragmatic recess of pleural cavity
Oblique fissure of left lung
Costodiaphragmatic recess of pleural cavity
Inferior border of right lung
Inferior border of left lung
Left dome of diaphragm
Pleural reflection
Pleural reflection
Costomediastinal recess of left pleural cavity
Gallbladder
Stomach
Right dome of diaphragm
Bare area of pericardial sac
Liver
Xiphoid process
F. Netter M.D.

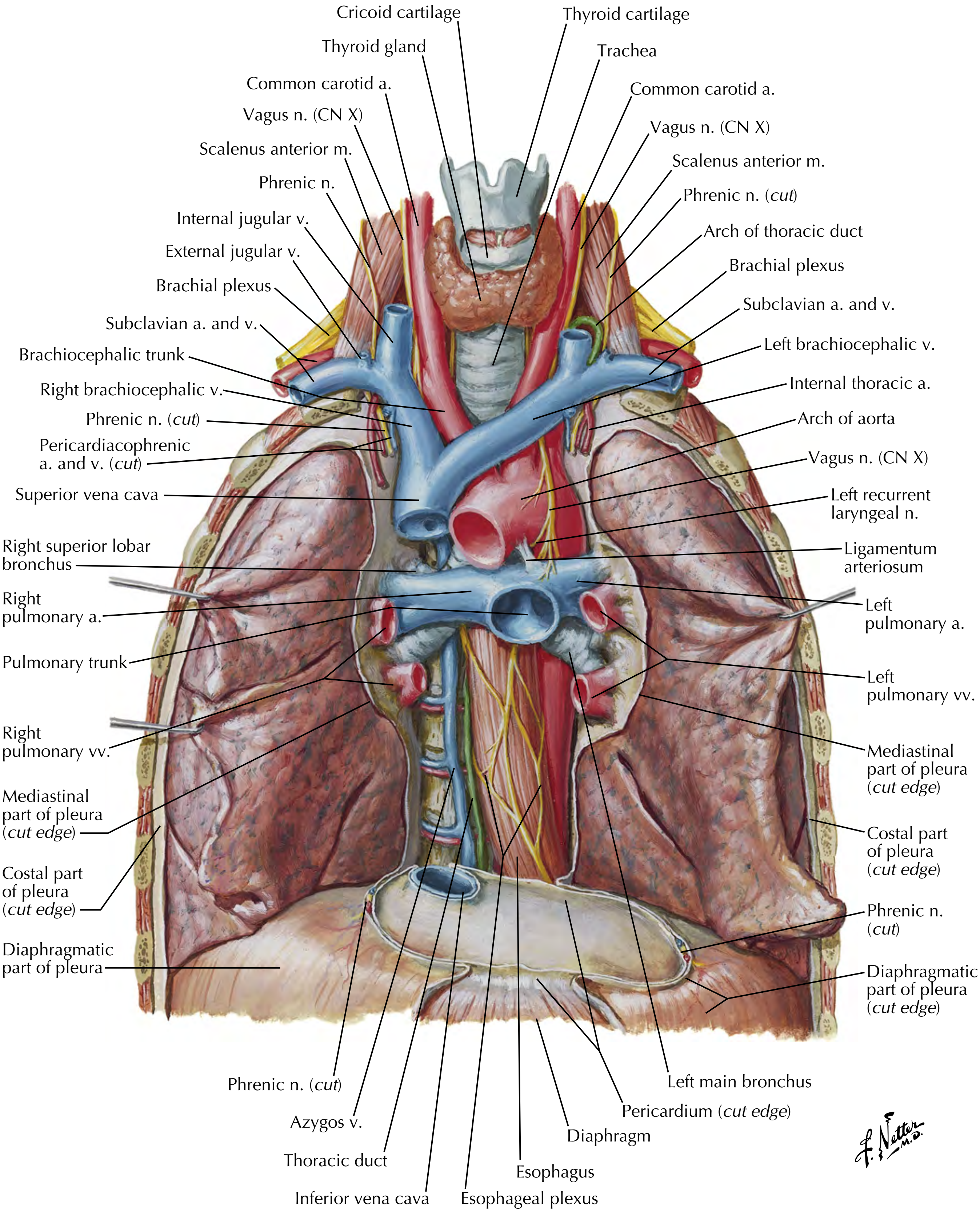

Spinous process of T1 vertebra
Apex of left lung
1st rib
Oblique fissure of left lung
Spine of scapula
Costal part of pleura
Cervical pleura
Oblique fissure of right lung
Clavicle
Horizontal fissure of right lung
Costal part of pleura
C 3
4
5
6
7
T 1
2
3
4
5
6
7
8
9
10
11
12
L 1
2
1
2
3
4
5
6
7
8
9
10
11
12
Costodiaphragmatic recess of pleural cavity
Spleen
Pleural reflection
Inferior border of left lung
Kidney
Left dome of diaphragm
Suprarenal gland
Costodiaphragmatic recess of pleural cavity
Liver
Pleural reflection
Inferior border of right lung
Kidney
Right dome of diaphragm
Suprarenal gland
F. Netter M.D.

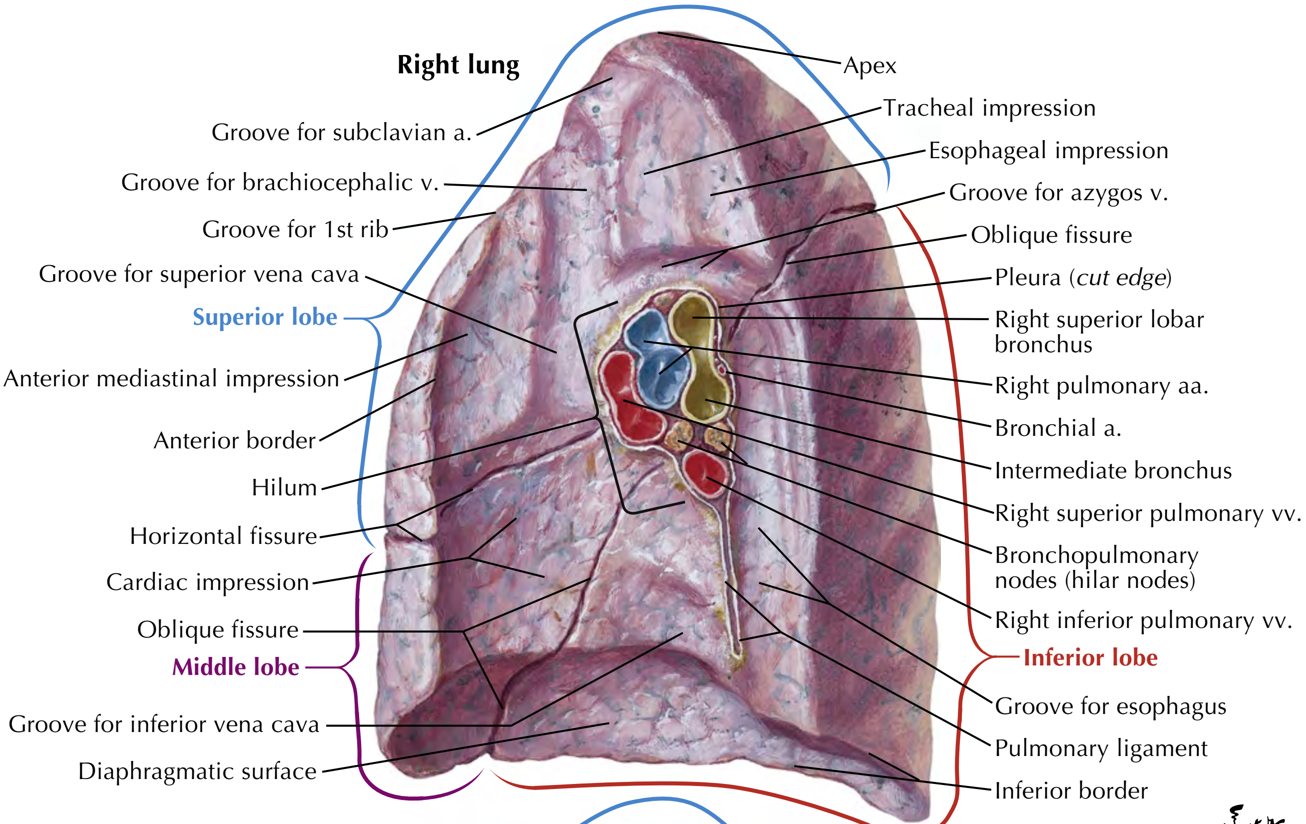
Lungs in Situ: Anterior View

See also **Plate 17**


Inferior thyroid v.
Trachea
Thyroid gland
Common carotid a.
Infrahyoid mm.
Internal jugular v.
Manubrium of sternum
Phrenic n.
Sternocleidomastoid m.
Scalenus anterior m.
External jugular v.
Thoracic duct
Costal part of pleura (*cut away*)
Thymus
Clavicle
Brachial plexus
Pectoralis major m.
Subclavian a. and v.
Internal thoracic a. and v.
Pectoralis minor m.
Axillary a. and v.
Intercostal mm.
Cardiac notch of left lung
Right lung
Superior lobe
Middle lobe
Inferior lobe
Superior lobe
Inferior lobe
Left lung
Costomediastinal recess
Oblique fissure
Horizontal fissure
Oblique fissure
Costodiaphragmatic recess
Diaphragmatic part of pleura
Musculophrenic a.
Lingula of left lung
Diaphragm
Internal thoracic a.
7th costal cartilage
Mediastinal part of pleura
Xiphoid process
Pleural reflections
Pericardial sac

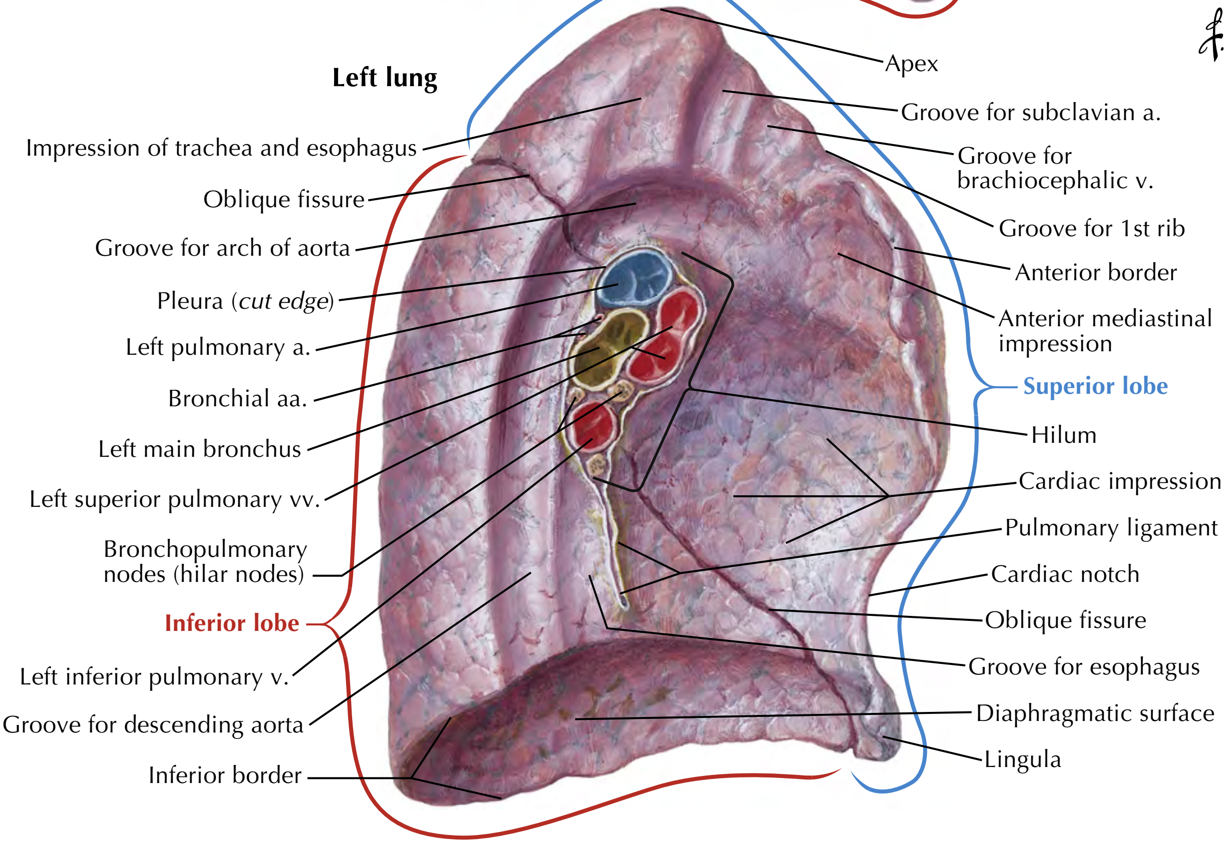
See also **Plate 227**


Cricoid cartilage
Thyroid cartilage
Thyroid gland
Trachea
Common carotid a.
Common carotid a.
Vagus n. (CN X)
Vagus n. (CN X)
Scalenus anterior m.
Scalenus anterior m.
Phrenic n.
Phrenic n. (*cut*)
Internal jugular v.
Arch of thoracic duct
External jugular v.
Brachial plexus
Brachial plexus
Subclavian a. and v.
Subclavian a. and v.
Brachiocephalic trunk
Left brachiocephalic v.
Right brachiocephalic v.
Internal thoracic a.
Phrenic n. (*cut*)
Arch of aorta
Pericardiacophrenic a. and v. (*cut*)
Vagus n. (CN X)
Superior vena cava
Left recurrent laryngeal n.
Right superior lobar bronchus
Ligamentum arteriosum
Right pulmonary a.
Left pulmonary a.
Pulmonary trunk
Left pulmonary vv.
Right pulmonary vv.
Mediastinal part of pleura (*cut edge*)
Mediastinal part of pleura (*cut edge*)
Costal part of pleura (*cut edge*)
Costal part of pleura (*cut edge*)
Phrenic n. (*cut*)
Diaphragmatic part of pleura
Diaphragmatic part of pleura (*cut edge*)
Phrenic n. (*cut*)
Left main bronchus
Azygos v.
Pericardium (*cut edge*)
Diaphragm
Thoracic duct
Esophagus
Inferior vena cava
Esophageal plexus
F. Netter M.D.



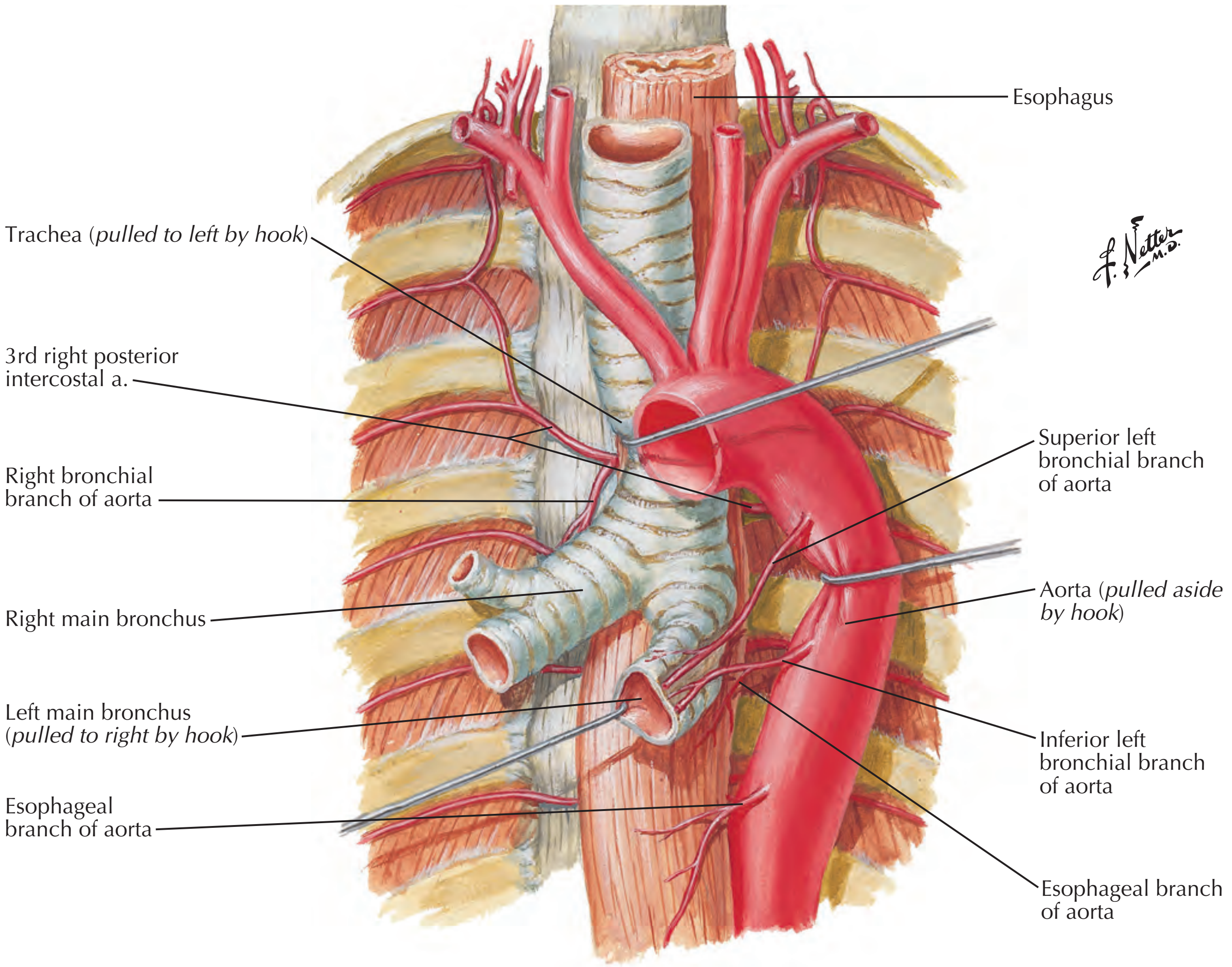
Right lung

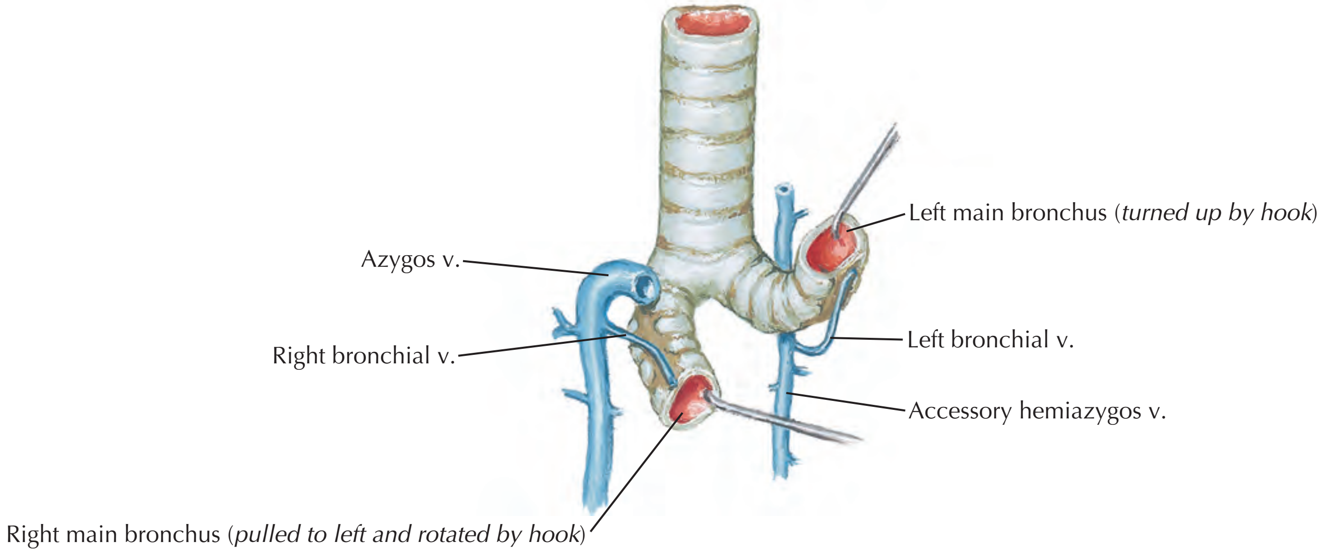
Apex
Groove for subclavian a.
Tracheal impression
Groove for brachiocephalic v.
Esophageal impression
Groove for azygos v.
Groove for 1st rib
Oblique fissure
Groove for superior vena cava
Pleura (cut edge)
Superior lobe
Right superior lobar bronchus
Anterior mediastinal impression
Right pulmonary aa.
Anterior border
Bronchial a.
Intermediate bronchus
Hilum
Right superior pulmonary vv.
Horizontal fissure
Bronchopulmonary nodes (hilar nodes)
Cardiac impression
Right inferior pulmonary vv.
Oblique fissure
Inferior lobe
Middle lobe
Groove for esophagus
Groove for inferior vena cava
Pulmonary ligament
Diaphragmatic surface
Inferior border



Left lung

Apex
Groove for subclavian a.
Impression of trachea and esophagus
Groove for brachiocephalic v.
Oblique fissure
Groove for 1st rib
Groove for arch of aorta
Anterior border
Pleura (cut edge)
Anterior mediastinal impression
Left pulmonary a.
Superior lobe
Bronchial aa.
Hilum
Left main bronchus
Cardiac impression
Left superior pulmonary vv.
Pulmonary ligament
Bronchopulmonary nodes (hilar nodes)
Cardiac notch
Inferior lobe
Oblique fissure
Left inferior pulmonary v.
Groove for esophagus
Groove for descending aorta
Diaphragmatic surface
Inferior border
Lingula

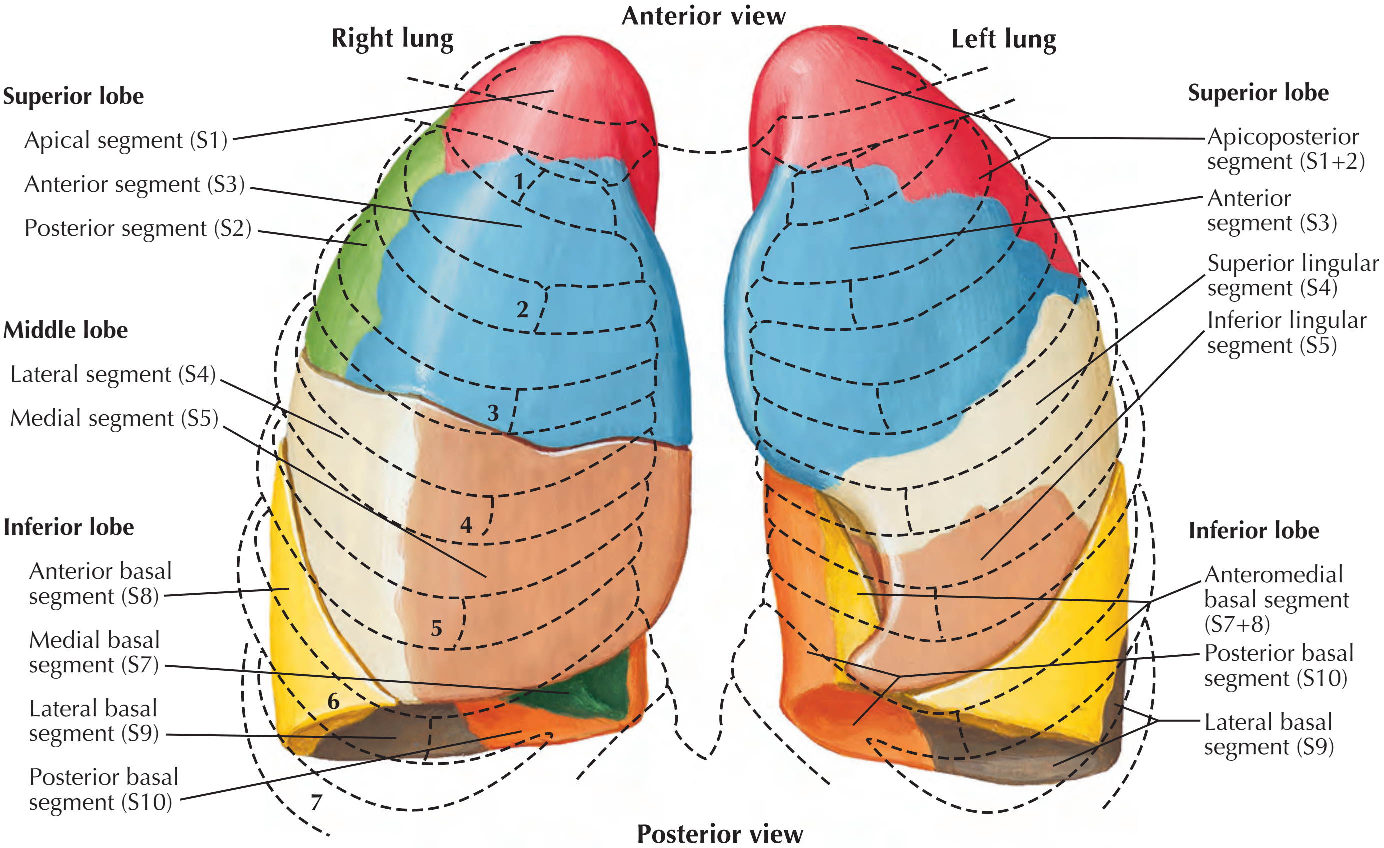

Esophagus
Trachea (*pulled to left by hook*)
3rd right posterior intercostal a.
Right bronchial branch of aorta
Right main bronchus
Left main bronchus (*pulled to right by hook*)
Esophageal branch of aorta
Superior left bronchial branch of aorta
Aorta (*pulled aside by hook*)
Inferior left bronchial branch of aorta
Esophageal branch of aorta


Left main bronchus (*turned up by hook*)
Azygos v.
Left bronchial v.
Right bronchial v.
Accessory hemiazygos v.
Right main bronchus (*pulled to left and rotated by hook*)

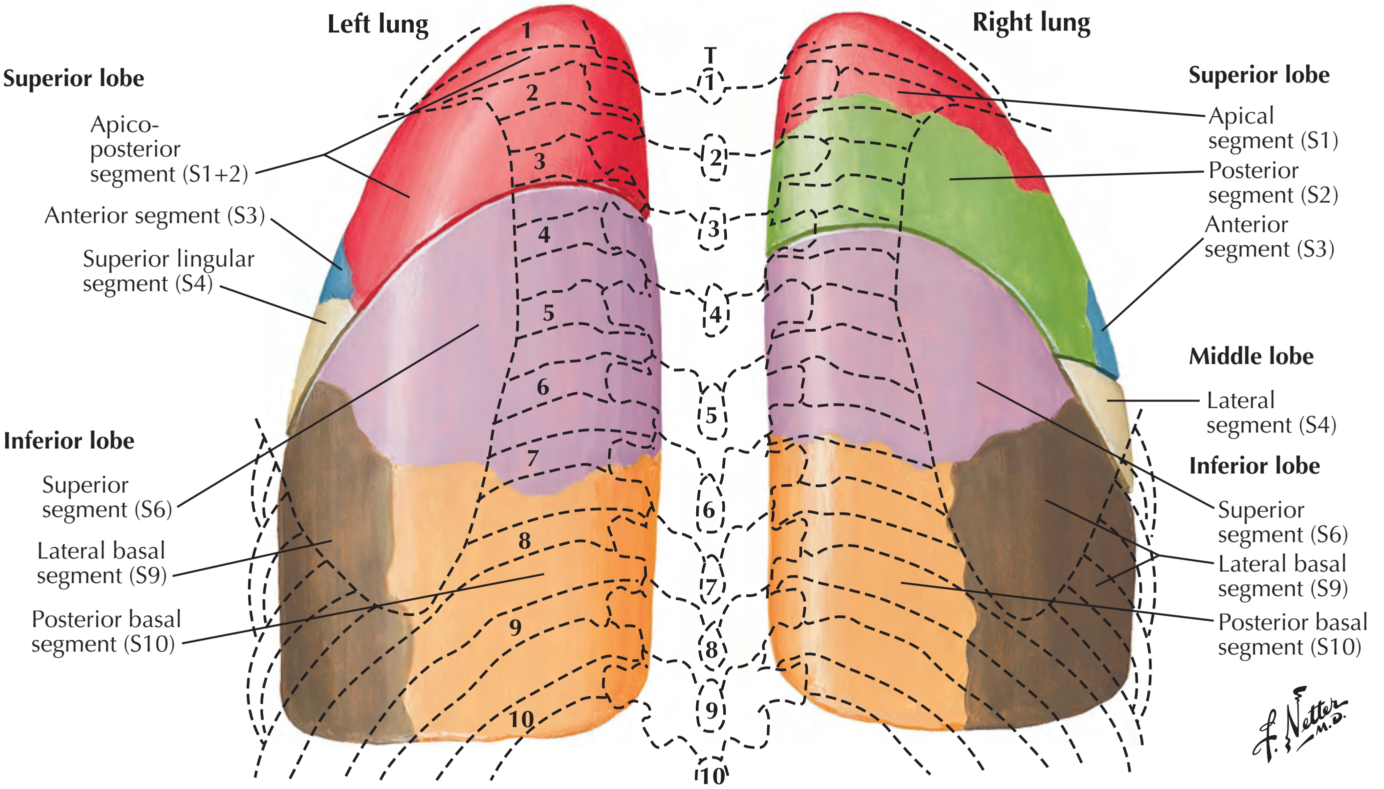
Bronchopulmonary Segments: Anterior and Posterior Views

See also **Plate 226**

Anterior view


Right lung
Left lung
Superior lobe
Apical segment (S1)
Anterior segment (S3)
Posterior segment (S2)
Middle lobe
Lateral segment (S4)
Medial segment (S5)
Inferior lobe
Anterior basal segment (S8)
Medial basal segment (S7)
Lateral basal segment (S9)
Posterior basal segment (S10)
Superior lobe
Apicoposterior segment (S1+2)
Anterior segment (S3)
Superior lingular segment (S4)
Inferior lingular segment (S5)
Inferior lobe
Anteromedial basal segment (S7+8)
Posterior basal segment (S10)
Lateral basal segment (S9)
1
2
3
4
5
6
7

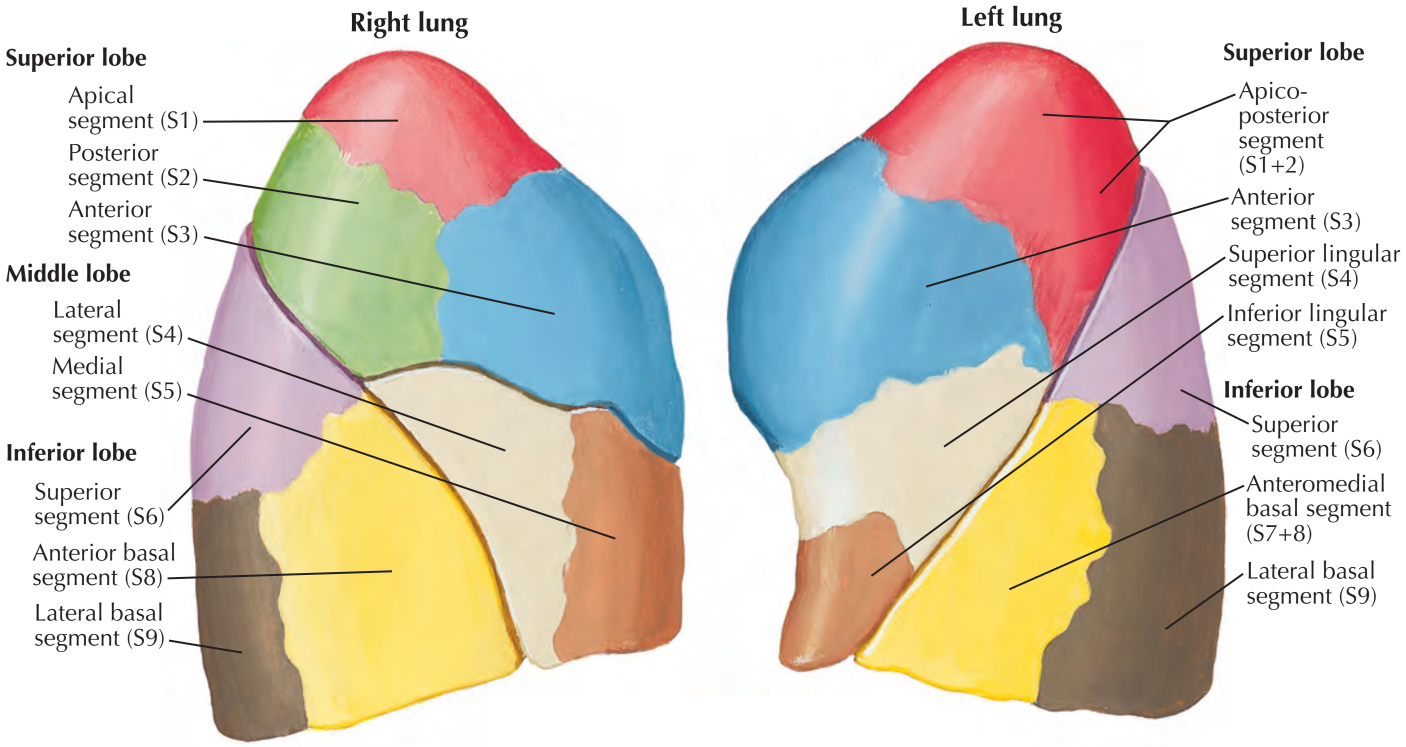
Posterior view


Left lung
Right lung
Superior lobe
Apico-posterior segment (S1+2)
Anterior segment (S3)
Superior lingular segment (S4)
Inferior lobe
Superior segment (S6)
Lateral basal segment (S9)
Posterior basal segment (S10)
Superior lobe
Apical segment (S1)
Posterior segment (S2)
Anterior segment (S3)
Middle lobe
Lateral segment (S4)
Inferior lobe
Superior segment (S6)
Lateral basal segment (S9)
Posterior basal segment (S10)
T
1
2
3
4
5
6
7
8
9
10

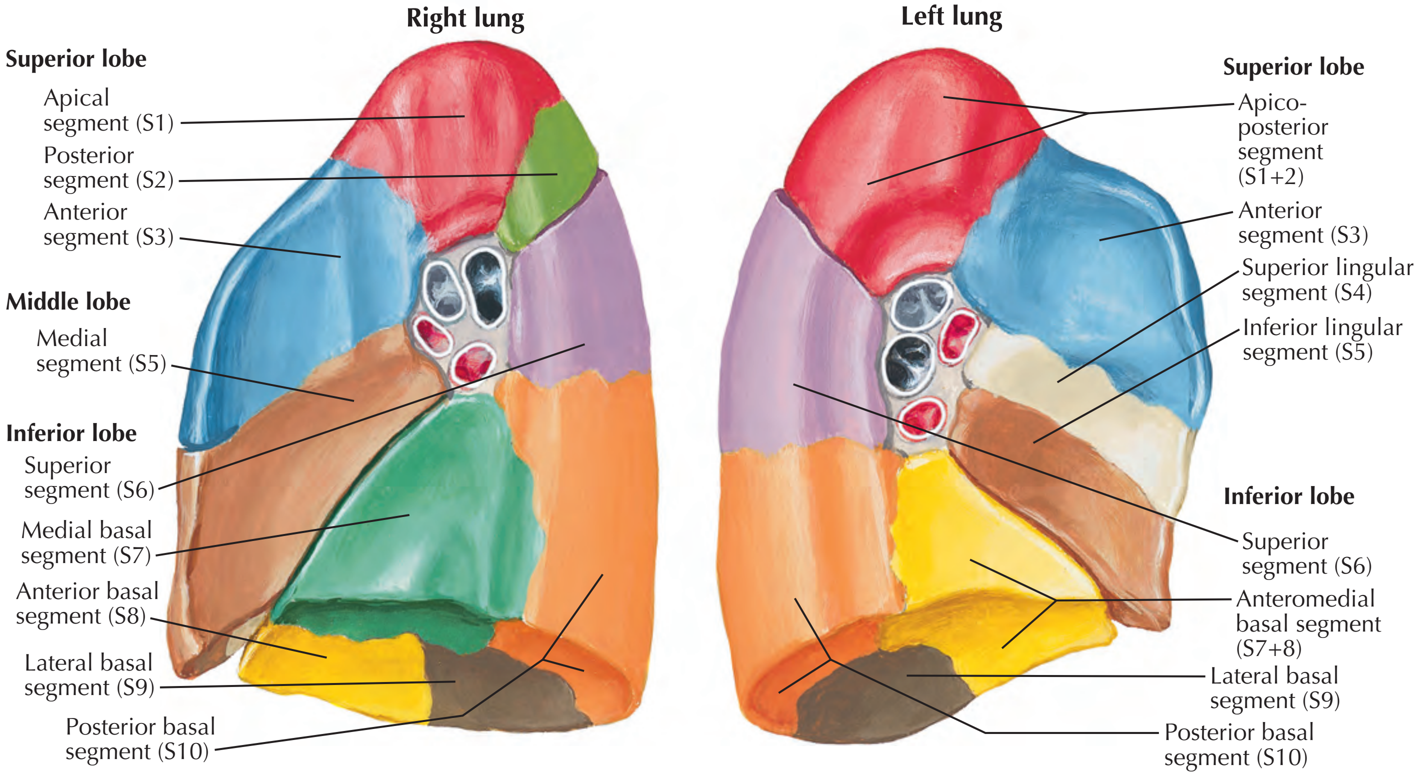
Bronchopulmonary Segments: Medial and Lateral Views

See also Plate 226

Lateral views

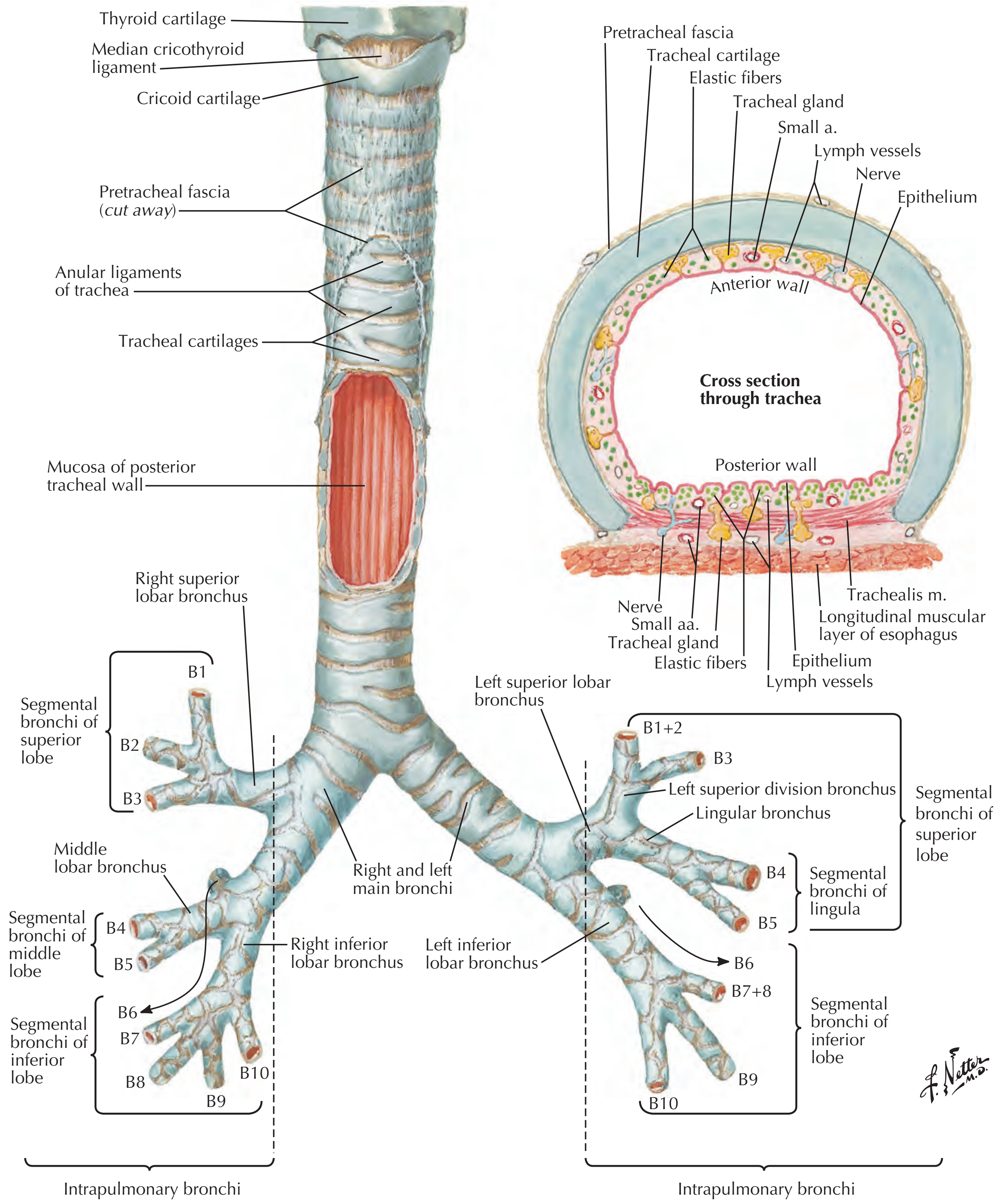

Right lung
Superior lobe
Apical segment (S1)
Posterior segment (S2)
Anterior segment (S3)
Middle lobe
Lateral segment (S4)
Medial segment (S5)
Inferior lobe
Superior segment (S6)
Anterior basal segment (S8)
Lateral basal segment (S9)
Left lung
Superior lobe
Apico-posterior segment (S1+2)
Anterior segment (S3)
Superior lingular segment (S4)
Inferior lingular segment (S5)
Inferior lobe
Superior segment (S6)
Anteromedial basal segment (S7+8)
Lateral basal segment (S9)

Medial views


Right lung
Superior lobe
Apical segment (S1)
Posterior segment (S2)
Anterior segment (S3)
Middle lobe
Medial segment (S5)
Inferior lobe
Superior segment (S6)
Medial basal segment (S7)
Anterior basal segment (S8)
Lateral basal segment (S9)
Posterior basal segment (S10)
Left lung
Superior lobe
Apico-posterior segment (S1+2)
Anterior segment (S3)
Superior lingular segment (S4)
Inferior lingular segment (S5)
Inferior lobe
Superior segment (S6)
Anteromedial basal segment (S7+8)
Lateral basal segment (S9)
Posterior basal segment (S10)

Trachea and Major Bronchi

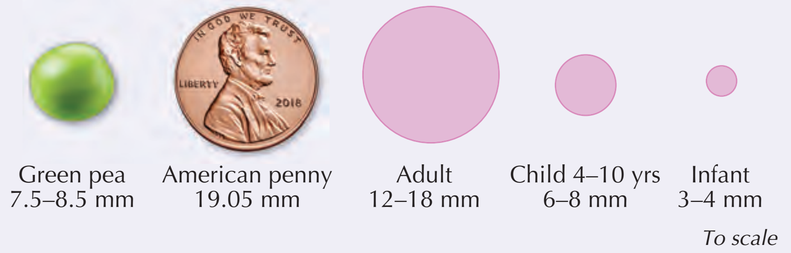
See also **Plates 97, 222, 230**

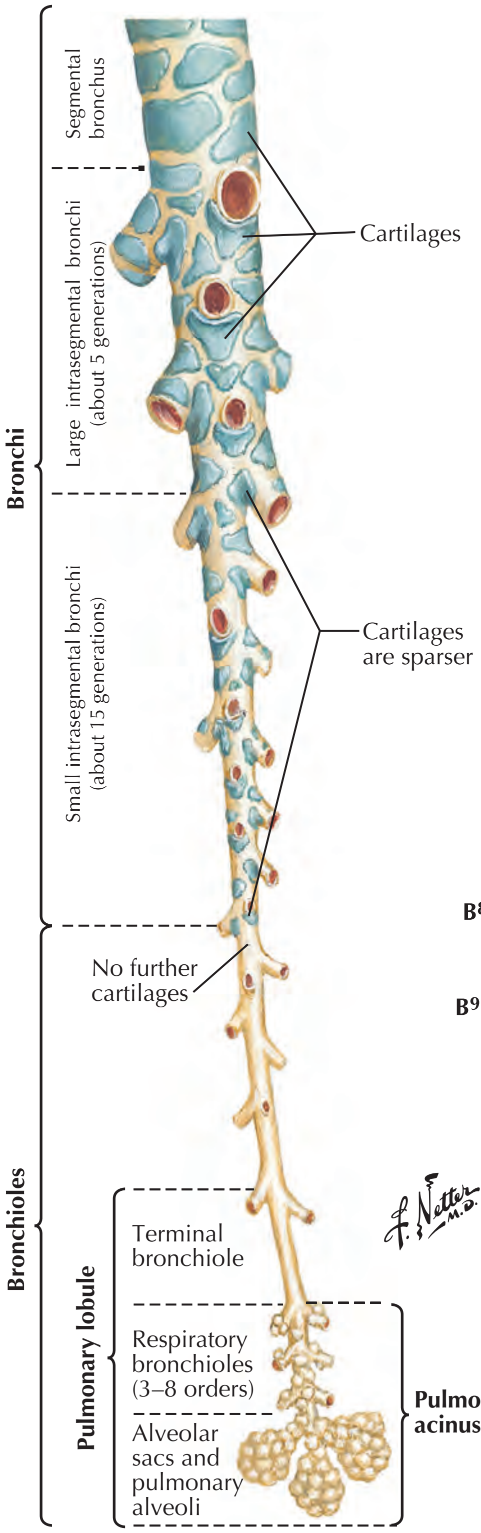


Thyroid cartilage
Median cricothyroid ligament
Cricoid cartilage
Pretracheal fascia (*cut away*)
Anular ligaments of trachea
Tracheal cartilages
Mucosa of posterior tracheal wall
Right superior lobar bronchus
B1
Segmental bronchi of superior lobe
B2
B3
Middle lobar bronchus
Segmental bronchi of middle lobe
B4
B5
Segmental bronchi of inferior lobe
B6
B7
B8
B9
B10
Right inferior lobar bronchus
Right and left main bronchi
Left inferior lobar bronchus
Left superior lobar bronchus
B1+2
B3
Left superior division bronchus
Lingular bronchus
Segmental bronchi of superior lobe
B4
B5
Segmental bronchi of lingula
B6
B7+8
B9
B10
Segmental bronchi of inferior lobe
Intrapulmonary bronchi
Intrapulmonary bronchi
Pretracheal fascia
Tracheal cartilage
Elastic fibers
Tracheal gland
Small a.
Lymph vessels
Nerve
Epithelium
Anterior wall
Cross section through trachea
Posterior wall
Nerve
Small aa.
Tracheal gland
Elastic fibers
Lymph vessels
Epithelium
Trachealis m.
Longitudinal muscular layer of esophagus

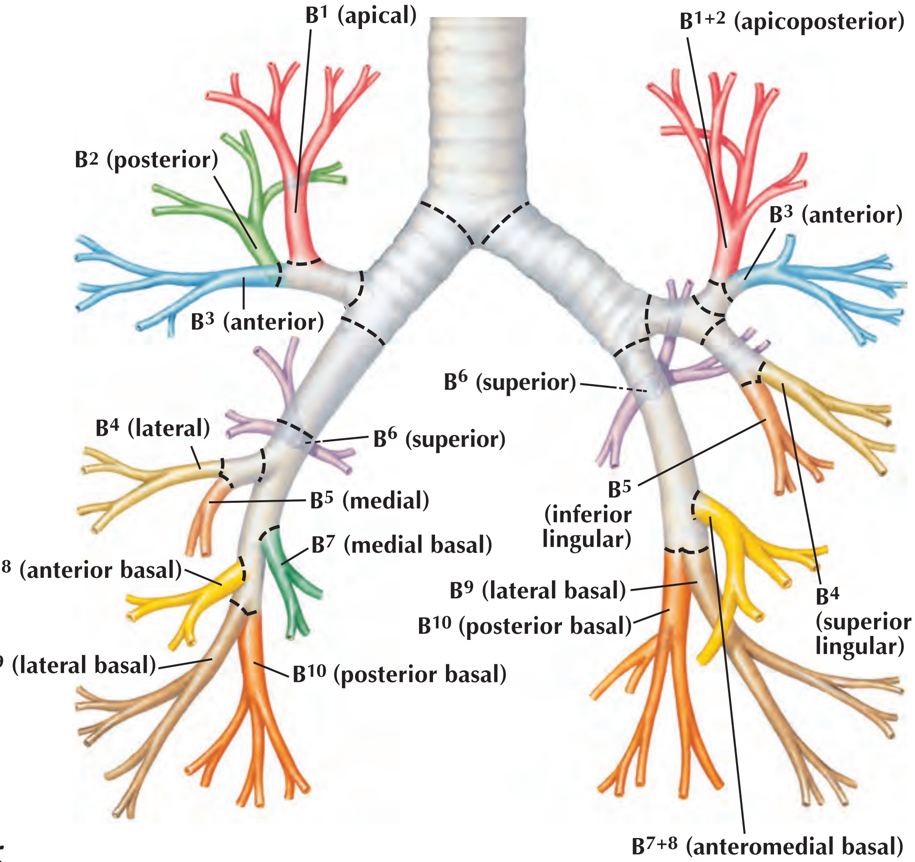
See also **Plates 227, BP 44, BP 45**

Approximate average diameter of lumen in main bronchi

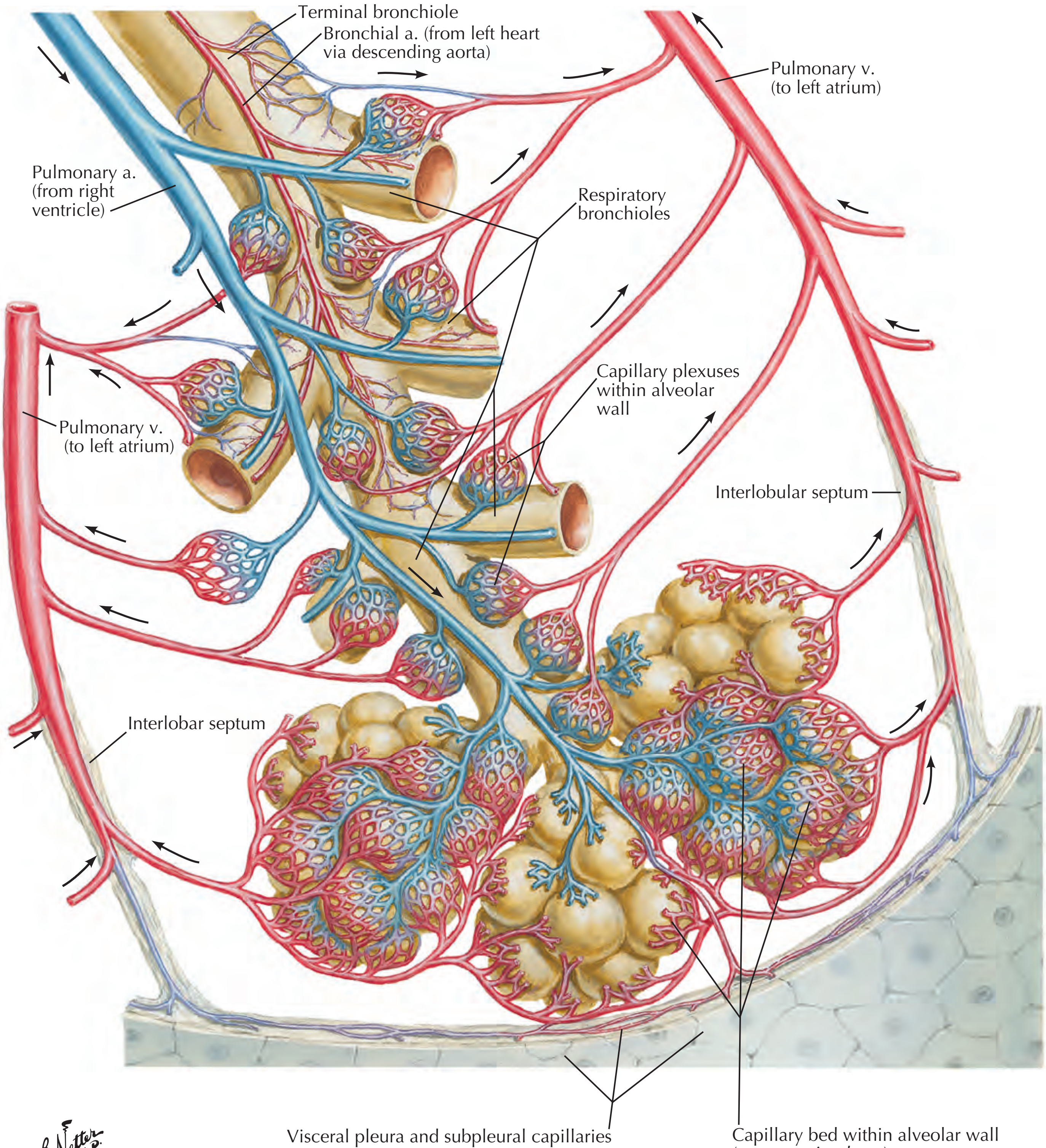



Bronchi
Segmental bronchus
Large intrasegmental bronchi (about 5 generations)
Small intrasegmental bronchi (about 15 generations)
Cartilages
Cartilages are sparser
No further cartilages
Bronchioles
Pulmonary lobule
Terminal bronchiole
Respiratory bronchioles (3–8 orders)
Alveolar sacs and pulmonary alveoli
Pulmonary acinus

Subdivisions of intrapulmonary airways


B1 (apical)
B1+2 (apicoposterior)
B2 (posterior)
B3 (anterior)
B3 (anterior)
B6 (superior)
B4 (lateral)
B6 (superior)
B5 (medial)
B5 (inferior lingular)
B7 (medial basal)
B8 (anterior basal)
B9 (lateral basal)
B4 (superior lingular)
B10 (posterior basal)
B9 (lateral basal)
B10 (posterior basal)
B7+8 (anteromedial basal)

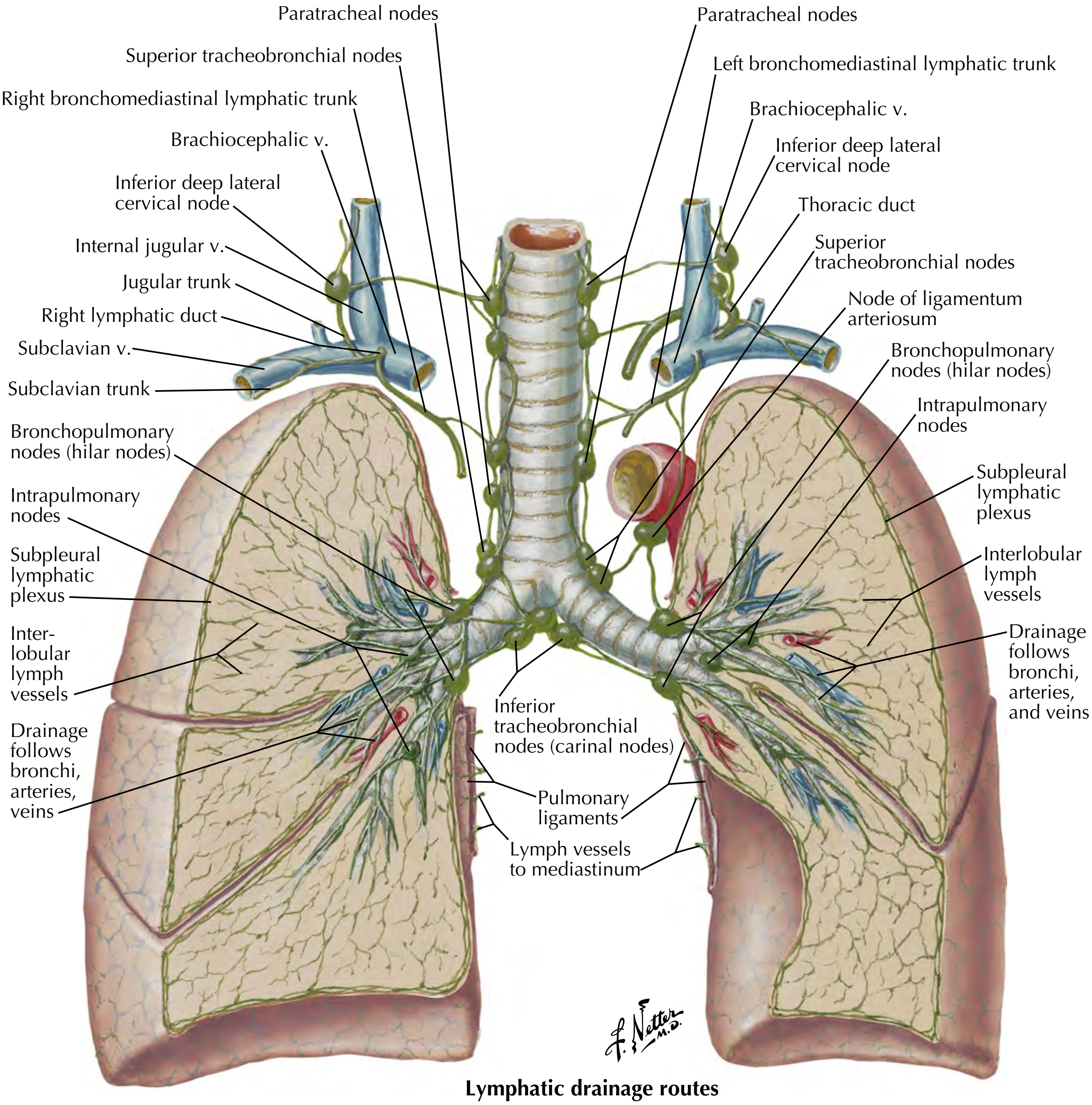
Nomenclature in common usage for bronchopulmonary segments (Plates 223 and 224) is that of Jackson and Huber, and segmental bronchi are named accordingly. Bronchial subdivisions as far as the 5th or 6th generations also are shown but not labelled. Segmental bronchi (B) are numbered from 1 to 10 in each lung, corresponding to the pulmonary segments. In the left lung, B^1 and B^2 are combined, as are B^7 and B^8. Variations of the standard bronchial pattern shown here are common, especially in peripheral airways.


Terminal bronchiole
Bronchial a. (from left heart via descending aorta)
Pulmonary v. (to left atrium)
Pulmonary a. (from right ventricle)
Respiratory bronchioles
Capillary plexuses within alveolar wall
Pulmonary v. (to left atrium)
Interlobular septum
Interlobar septum
Visceral pleura and subpleural capillaries
Capillary bed within alveolar wall (*cut away in places*)

Pulmonary arteries and their branches distribute segmentally with the bronchi. Pulmonary veins and their tributaries drain intersegmentally.

Lymph Vessels of Thorax and Pulmonary and Mediastinal Lymph Nodes

See also **Plates 101, 260, BP 51**


Paratracheal nodes
Superior tracheobronchial nodes
Right bronchomediastinal lymphatic trunk
Brachiocephalic v.
Inferior deep lateral cervical node
Internal jugular v.
Jugular trunk
Right lymphatic duct
Subclavian v.
Subclavian trunk
Bronchopulmonary nodes (hilar nodes)
Intrapulmonary nodes
Subpleural lymphatic plexus
Inter-lobular lymph vessels
Drainage follows bronchi, arteries, veins
Paratracheal nodes
Left bronchomediastinal lymphatic trunk
Brachiocephalic v.
Inferior deep lateral cervical node
Thoracic duct
Superior tracheobronchial nodes
Node of ligamentum arteriosum
Bronchopulmonary nodes (hilar nodes)
Intrapulmonary nodes
Subpleural lymphatic plexus
Interlobular lymph vessels
Drainage follows bronchi, arteries, and veins
Inferior tracheobronchial nodes (carinal nodes)
Pulmonary ligaments
Lymph vessels to mediastinum
F. Netter M.D.

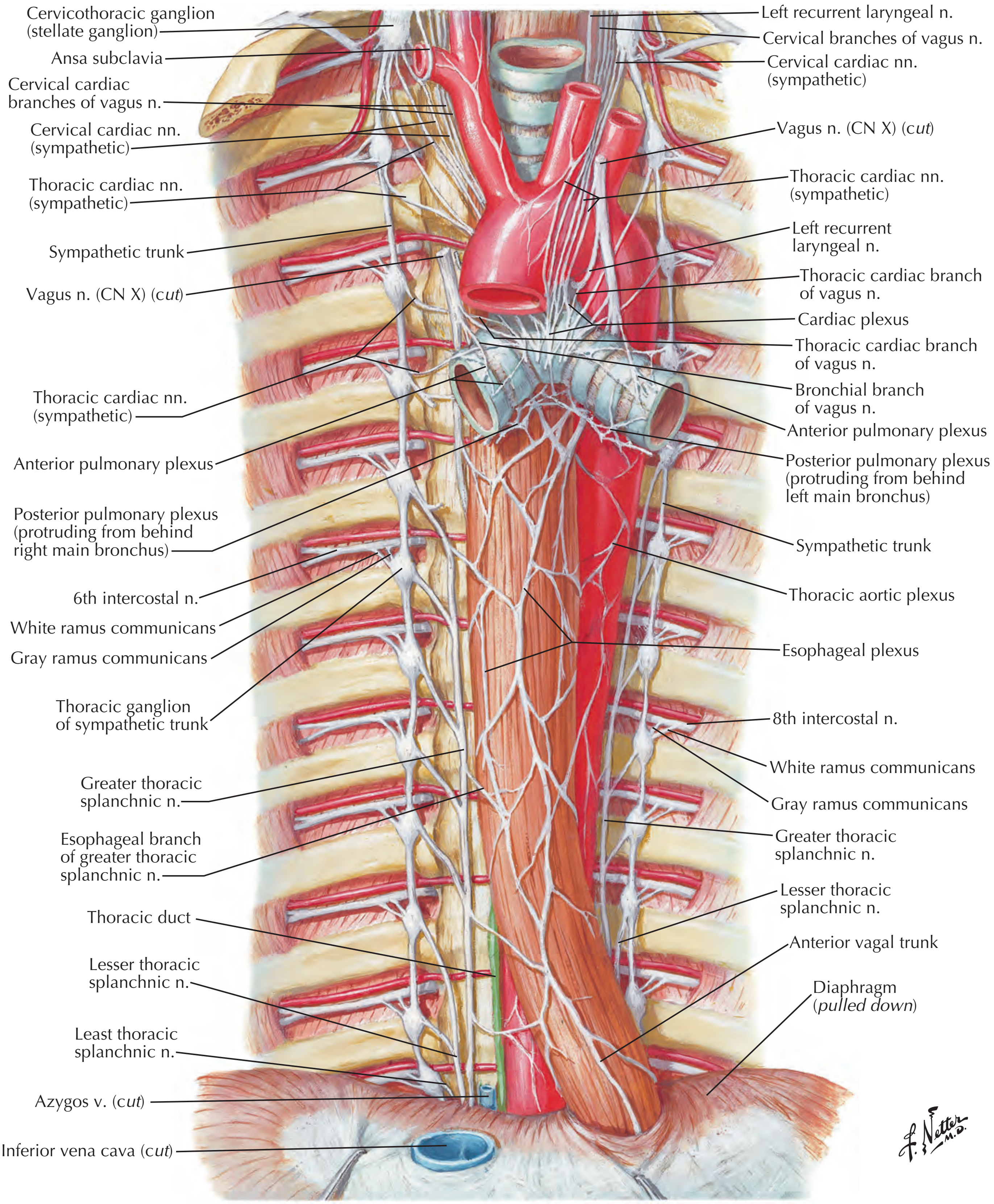
Lymphatic drainage routes

Right lung: All lobes drain to intrapulmonary and bronchopulmonary nodes, then to inferior tracheobronchial nodes, right superior tracheobronchial nodes, and right paratracheal nodes on the way to the brachiocephalic vein via the right bronchomediastinal and jugular trunks.

Left lung: The superior lobe drains to intrapulmonary and bronchopulmonary nodes, then to inferior tracheobronchial nodes, left superior tracheobronchial nodes, left paratracheal nodes and the node of the ligamentum arteriosum on the way to the brachiocephalic vein via the left bronchomediastinal trunk and thoracic duct. The intrapulmonary and bronchopulmonary nodes of the left lung also drain to right superior tracheobronchial nodes, where the lymph follows the same route as lymph from the right lung.

Autonomic Nerves of Thorax

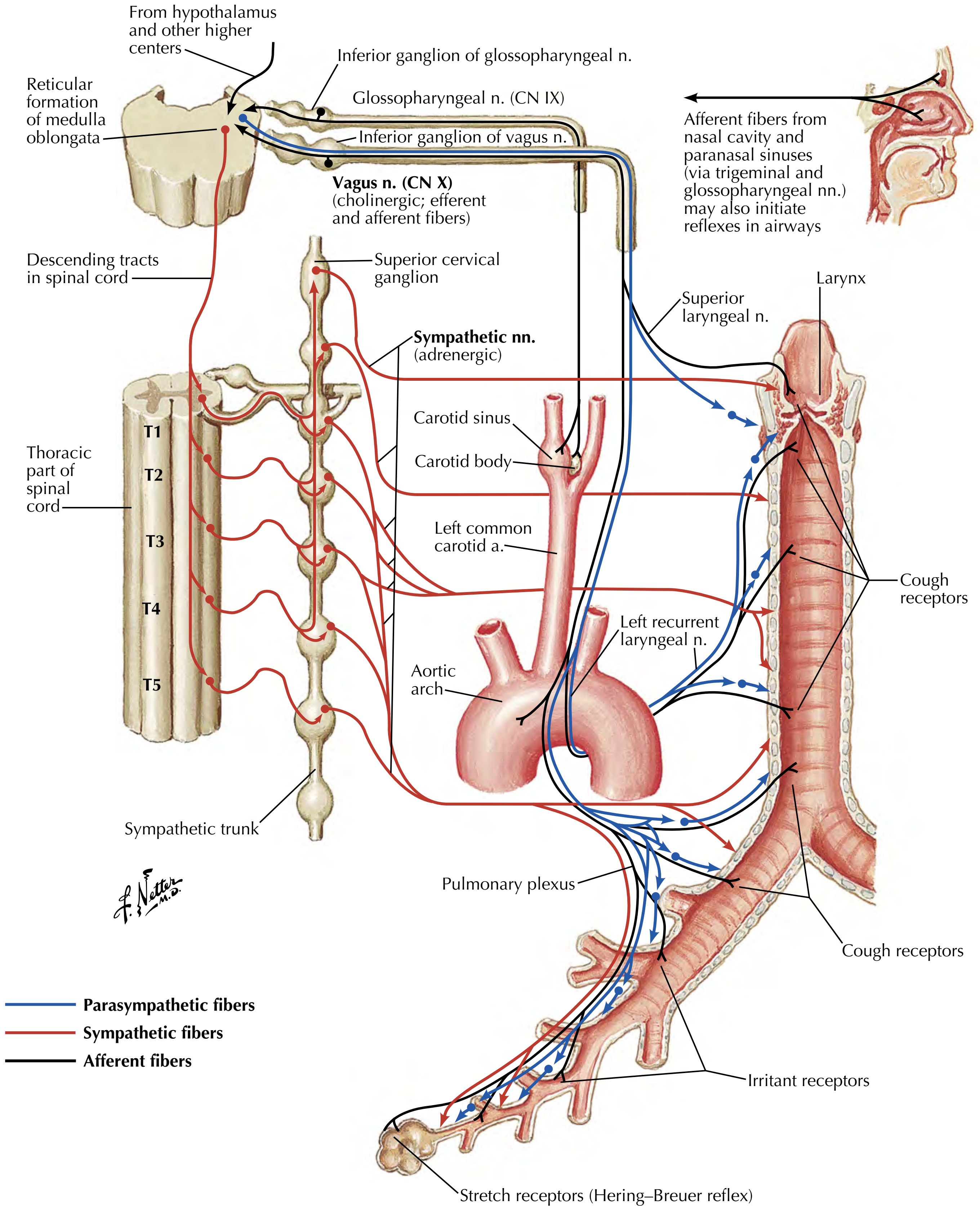
See also **Plates 249, BP 52**



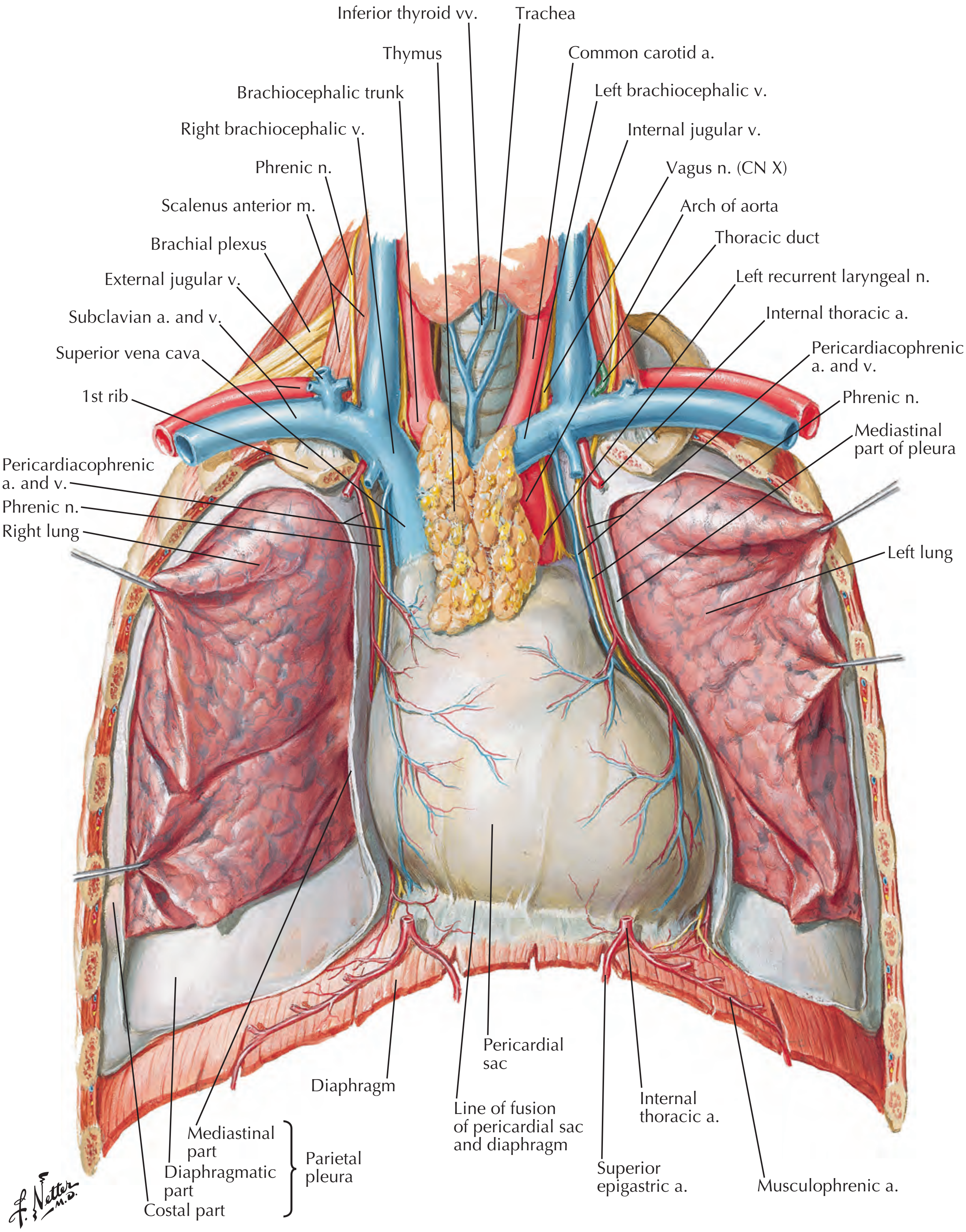
Cervicothoracic ganglion (stellate ganglion)
Ansa subclavia
Cervical cardiac branches of vagus n.
Cervical cardiac nn. (sympathetic)
Thoracic cardiac nn. (sympathetic)
Sympathetic trunk
Vagus n. (CN X) (*cut*)
Thoracic cardiac nn. (sympathetic)
Anterior pulmonary plexus
Posterior pulmonary plexus (protruding from behind right main bronchus)
6th intercostal n.
White ramus communicans
Gray ramus communicans
Thoracic ganglion of sympathetic trunk
Greater thoracic splanchnic n.
Esophageal branch of greater thoracic splanchnic n.
Thoracic duct
Lesser thoracic splanchnic n.
Least thoracic splanchnic n.
Azygos v. (*cut*)
Inferior vena cava (*cut*)
Left recurrent laryngeal n.
Cervical branches of vagus n.
Cervical cardiac nn. (sympathetic)
Vagus n. (CN X) (*cut*)
Thoracic cardiac nn. (sympathetic)
Left recurrent laryngeal n.
Thoracic cardiac branch of vagus n.
Cardiac plexus
Thoracic cardiac branch of vagus n.
Bronchial branch of vagus n.
Anterior pulmonary plexus
Posterior pulmonary plexus (protruding from behind left main bronchus)
Sympathetic trunk
Thoracic aortic plexus
Esophageal plexus
8th intercostal n.
White ramus communicans
Gray ramus communicans
Greater thoracic splanchnic n.
Lesser thoracic splanchnic n.
Anterior vagal trunk
Diaphragm (*pulled down*)
F. Netter M.D.

Innervation of Tracheobronchial Tree: Schema

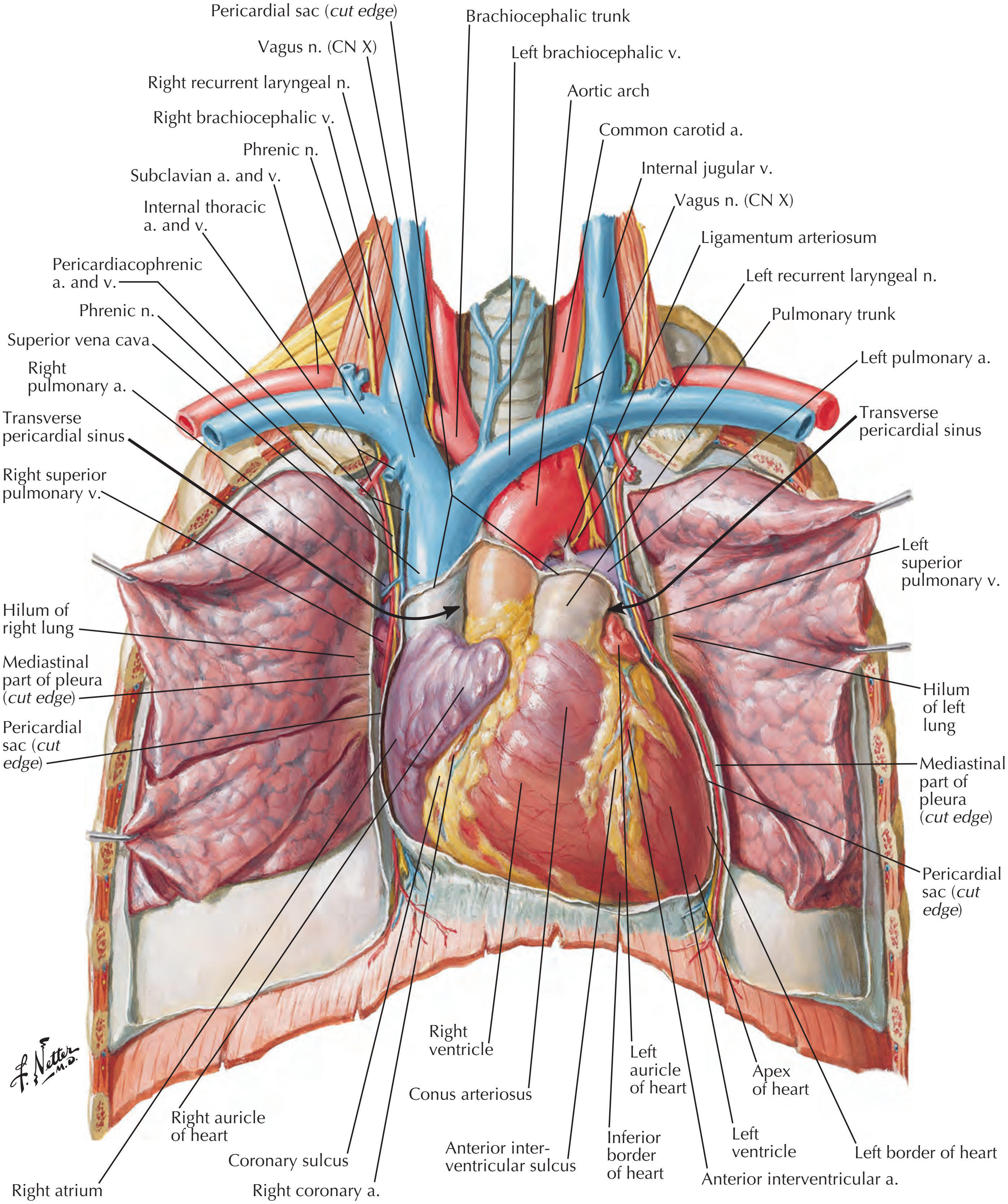
See also **Plate 250**


From hypothalamus and other higher centers
Reticular formation of medulla oblongata
Inferior ganglion of glossopharyngeal n.
Glossopharyngeal n. (CN IX)
Inferior ganglion of vagus n.
Vagus n. (CN X) (cholinergic; efferent and afferent fibers)
Afferent fibers from nasal cavity and paranasal sinuses (via trigeminal and glossopharyngeal nn.) may also initiate reflexes in airways
Descending tracts in spinal cord
Superior cervical ganglion
Larynx
Superior laryngeal n.
Sympathetic nn. (adrenergic)
Carotid sinus
Carotid body
T1
T2
T3
T4
T5
Thoracic part of spinal cord
Left common carotid a.
Cough receptors
Left recurrent laryngeal n.
Aortic arch
Sympathetic trunk
Pulmonary plexus
Cough receptors
F. Netter M.D.
Parasympathetic fibers
Sympathetic fibers
Afferent fibers
Irritant receptors
Stretch receptors (Hering–Breuer reflex)

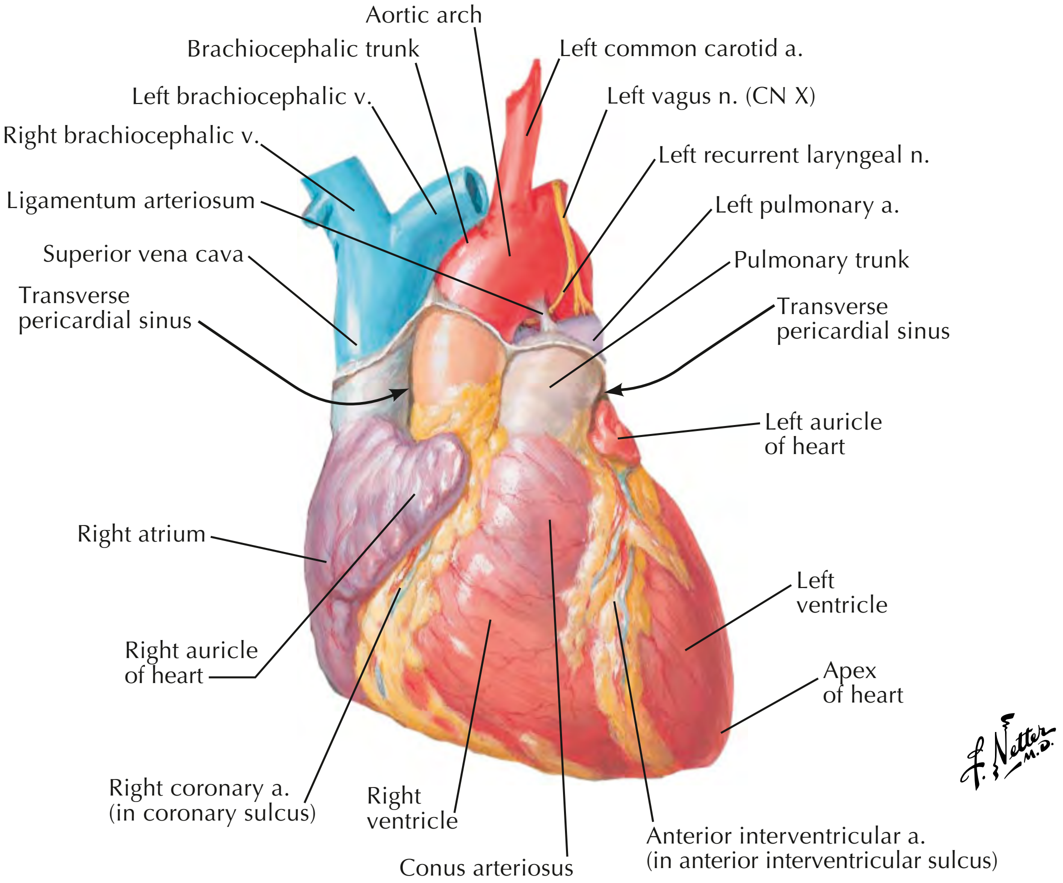
See also **Plates 233, 236**


Inferior thyroid vv.
Trachea
Thymus
Common carotid a.
Brachiocephalic trunk
Left brachiocephalic v.
Right brachiocephalic v.
Internal jugular v.
Phrenic n.
Vagus n. (CN X)
Scalenus anterior m.
Arch of aorta
Brachial plexus
Thoracic duct
External jugular v.
Left recurrent laryngeal n.
Subclavian a. and v.
Internal thoracic a.
Superior vena cava
Pericardiacophrenic a. and v.
1st rib
Phrenic n.
Mediastinal part of pleura
Pericardiacophrenic a. and v.
Phrenic n.
Right lung
Left lung
Pericardial sac
Diaphragm
Line of fusion of pericardial sac and diaphragm
Internal thoracic a.
Mediastinal part
Diaphragmatic part
Costal part
Parietal pleura
Superior epigastric a.
Musculophrenic a.
F. Netter M.D.

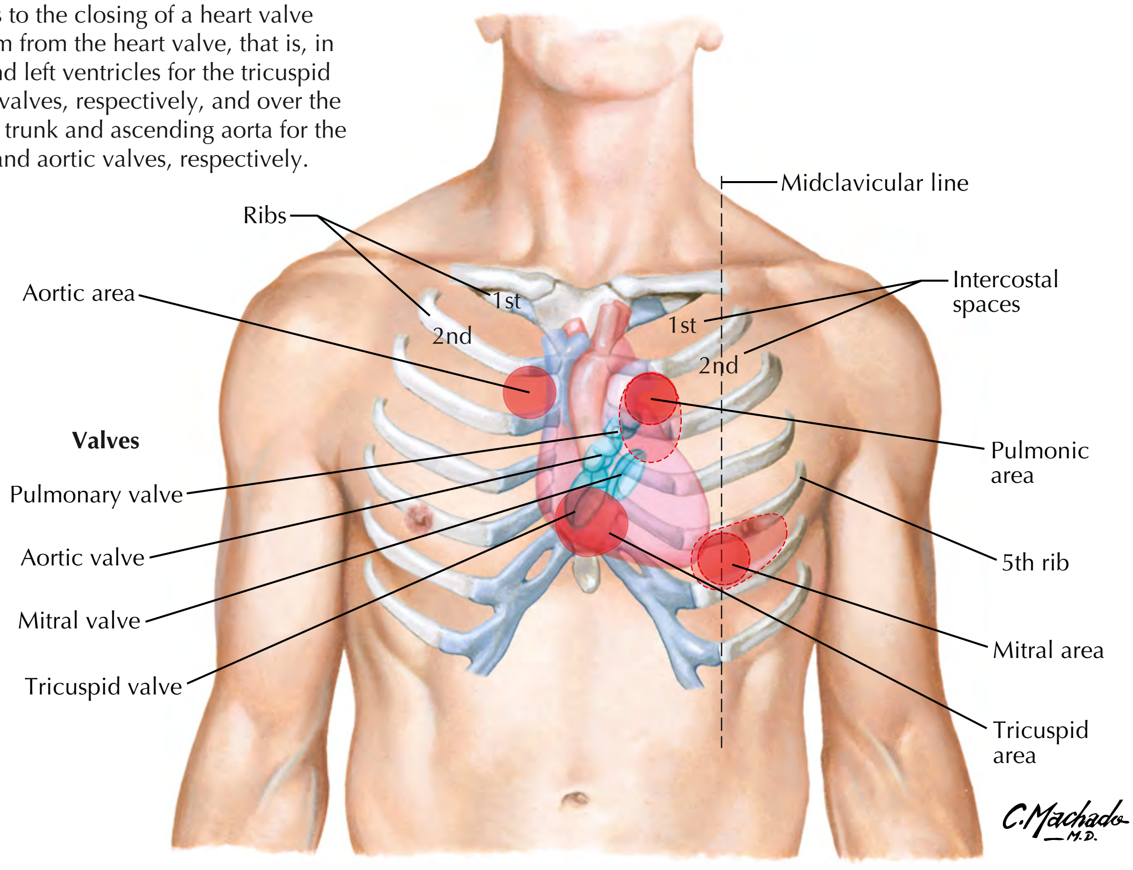
See also **Plates 236, BP 51**


Pericardial sac (*cut edge*)
Vagus n. (CN X)
Right recurrent laryngeal n.
Right brachiocephalic v.
Phrenic n.
Subclavian a. and v.
Internal thoracic a. and v.
Pericardiacophrenic a. and v.
Phrenic n.
Superior vena cava
Right pulmonary a.
Transverse pericardial sinus
Right superior pulmonary v.
Hilum of right lung
Mediastinal part of pleura (*cut edge*)
Pericardial sac (*cut edge*)
Brachiocephalic trunk
Left brachiocephalic v.
Aortic arch
Common carotid a.
Internal jugular v.
Vagus n. (CN X)
Ligamentum arteriosum
Left recurrent laryngeal n.
Pulmonary trunk
Left pulmonary a.
Transverse pericardial sinus
Left superior pulmonary v.
Hilum of left lung
Mediastinal part of pleura (*cut edge*)
Pericardial sac (*cut edge*)
F. Netter M.D.
Right ventricle
Conus arteriosus
Left auricle of heart
Apex of heart
Right auricle of heart
Coronary sulcus
Anterior interventricular sulcus
Inferior border of heart
Left ventricle
Left border of heart
Right atrium
Right coronary a.
Anterior interventricular a.

Heart and Precordial Areas of Auscultation

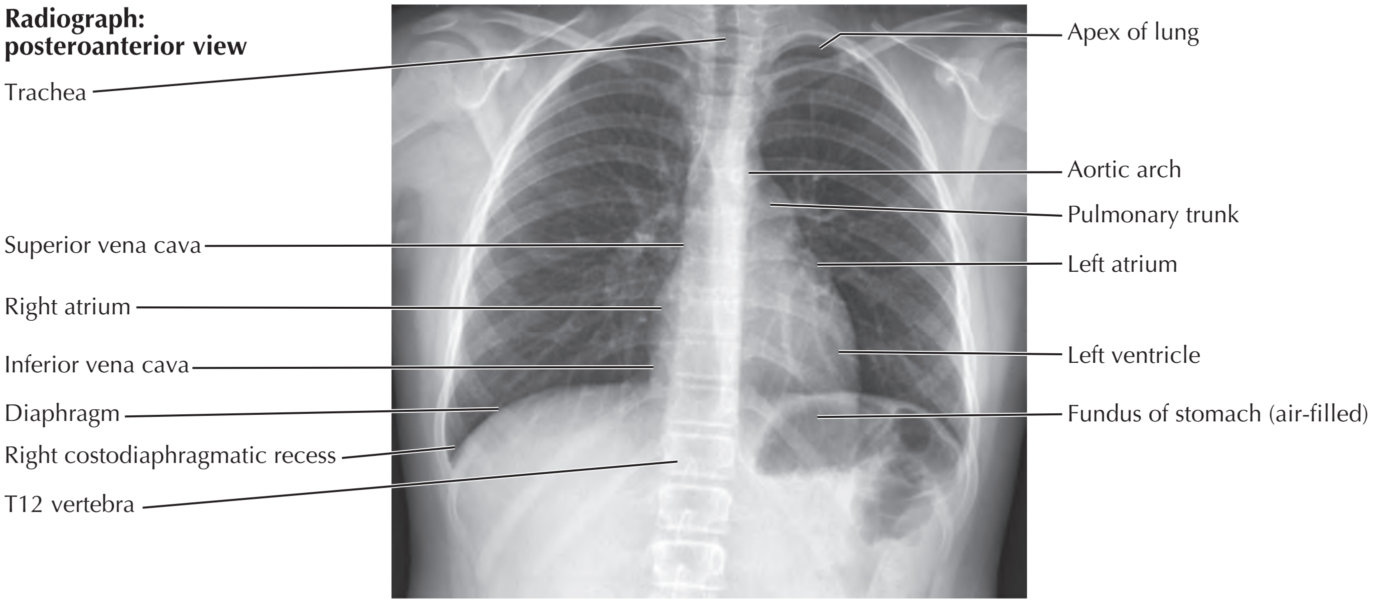

Aortic arch
Brachiocephalic trunk
Left common carotid a.
Left brachiocephalic v.
Left vagus n. (CN X)
Right brachiocephalic v.
Left recurrent laryngeal n.
Ligamentum arteriosum
Left pulmonary a.
Superior vena cava
Pulmonary trunk
Transverse pericardial sinus
Transverse pericardial sinus
Left auricle of heart
Right atrium
Left ventricle
Right auricle of heart
Apex of heart
Right coronary a. (in coronary sulcus)
Right ventricle
Conus arteriosus
Anterior interventricular a. (in anterior interventricular sulcus)

Precordial areas of auscultation:
One listens to the closing of a heart valve downstream from the heart valve, that is, in the right and left ventricles for the tricuspid and mitral valves, respectively, and over the pulmonary trunk and ascending aorta for the pulmonic and aortic valves, respectively.

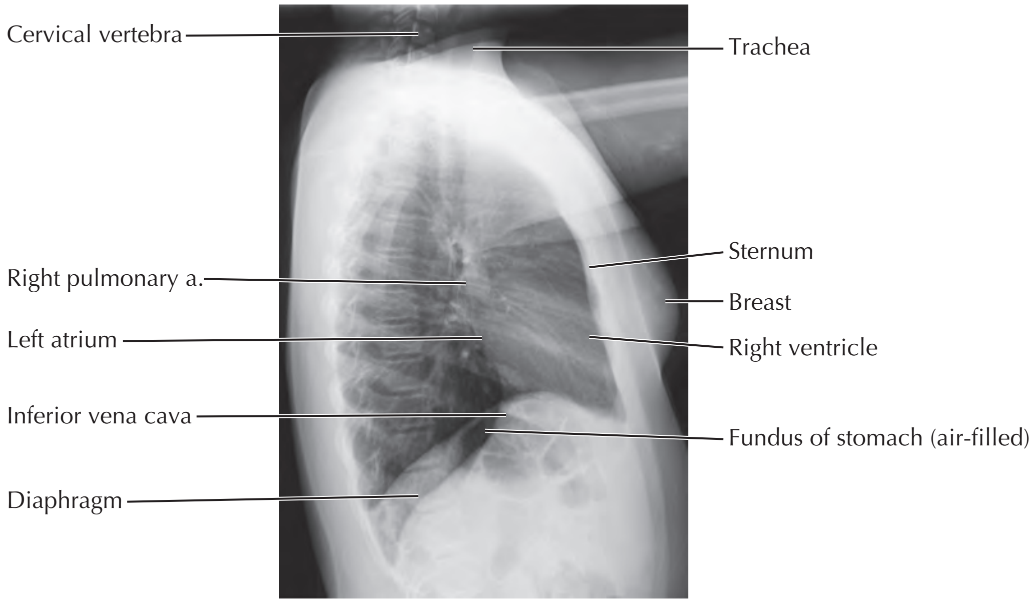

Midclavicular line
Ribs
1st
2nd
Aortic area
1st
2nd
Intercostal spaces
Valves
Pulmonary valve
Aortic valve
Mitral valve
Tricuspid valve
Pulmonic area
5th rib
Mitral area
Tricuspid area

See also **Plates 233, BP 51**

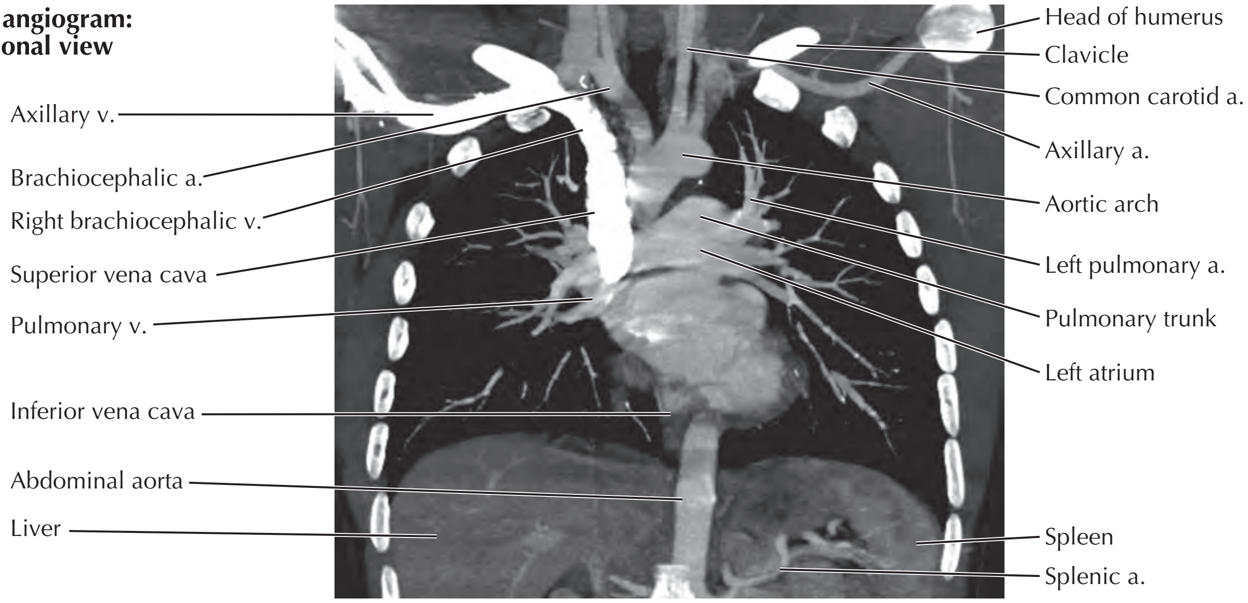
Radiograph: posteroanterior view


Trachea
Apex of lung
Aortic arch
Pulmonary trunk
Superior vena cava
Left atrium
Right atrium
Left ventricle
Inferior vena cava
Diaphragm
Fundus of stomach (air-filled)
Right costodiaphragmatic recess
T12 vertebra

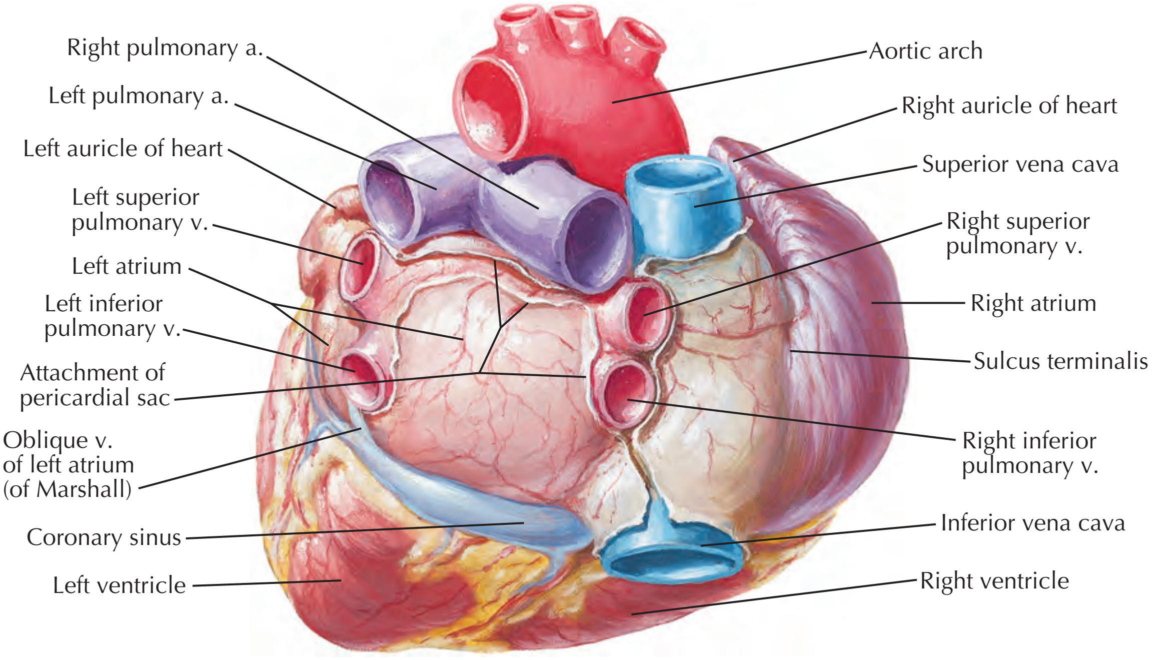
Radiograph: lateral view


Cervical vertebra
Trachea
Sternum
Right pulmonary a.
Breast
Left atrium
Right ventricle
Inferior vena cava
Fundus of stomach (air-filled)
Diaphragm

CT angiogram: coronal view

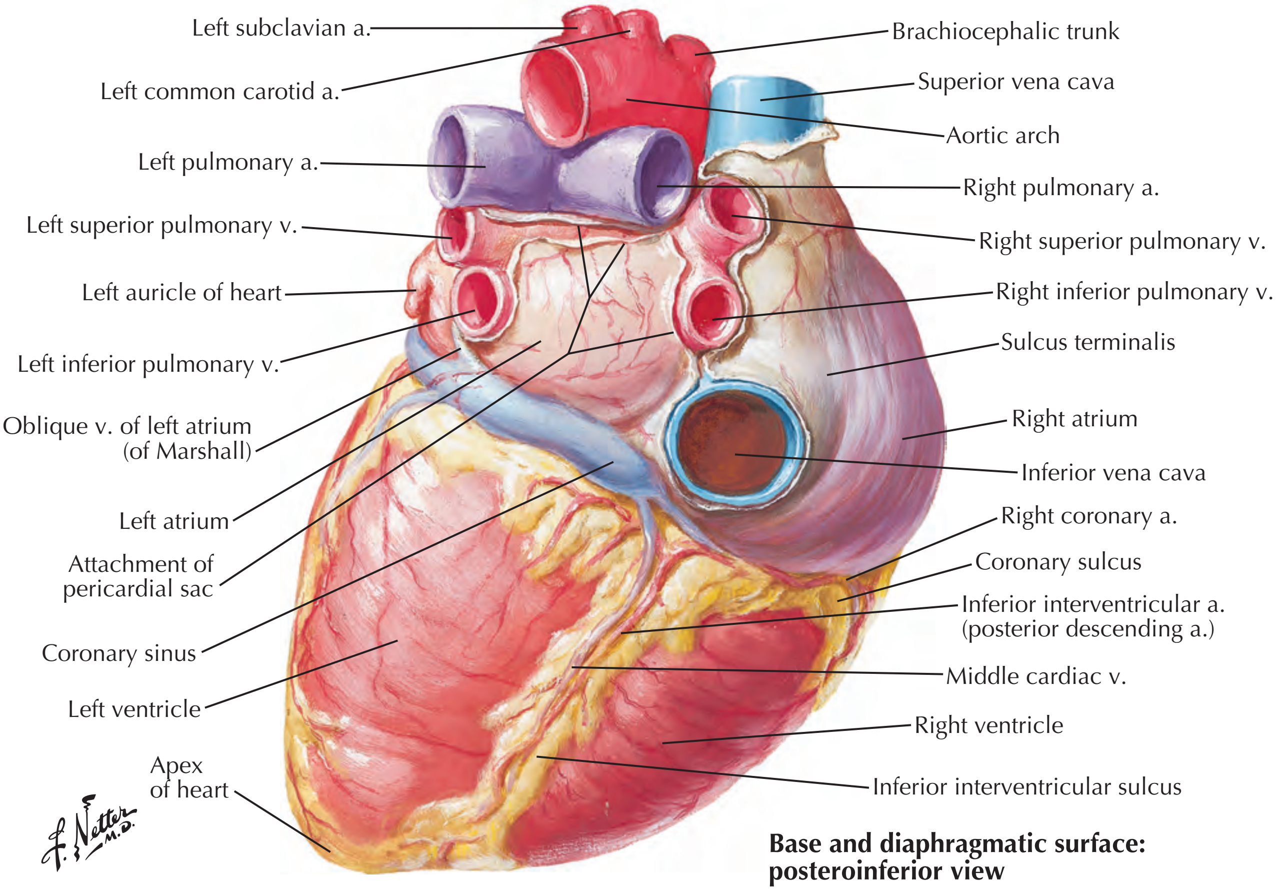

Head of humerus
Clavicle
Common carotid a.
Axillary v.
Axillary a.
Brachiocephalic a.
Aortic arch
Right brachiocephalic v.
Superior vena cava
Left pulmonary a.
Pulmonary trunk
Pulmonary v.
Left atrium
Inferior vena cava
Abdominal aorta
Liver
Spleen
Splenic a.

Heart: Base and Diaphragmatic Surface



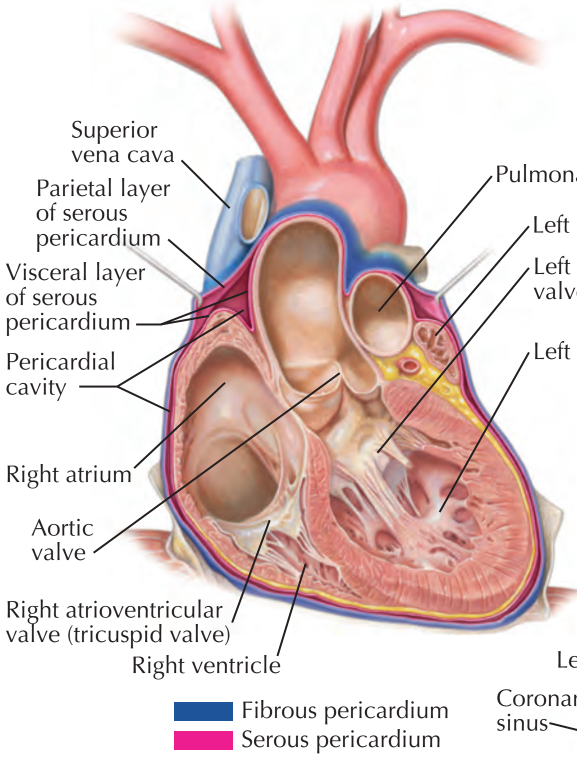
Right pulmonary a.
Left pulmonary a.
Left auricle of heart
Left superior pulmonary v.
Left atrium
Left inferior pulmonary v.
Attachment of pericardial sac
Oblique v. of left atrium (of Marshall)
Coronary sinus
Left ventricle
Aortic arch
Right auricle of heart
Superior vena cava
Right superior pulmonary v.
Right atrium
Sulcus terminalis
Right inferior pulmonary v.
Inferior vena cava
Right ventricle

Base of heart: posterior view

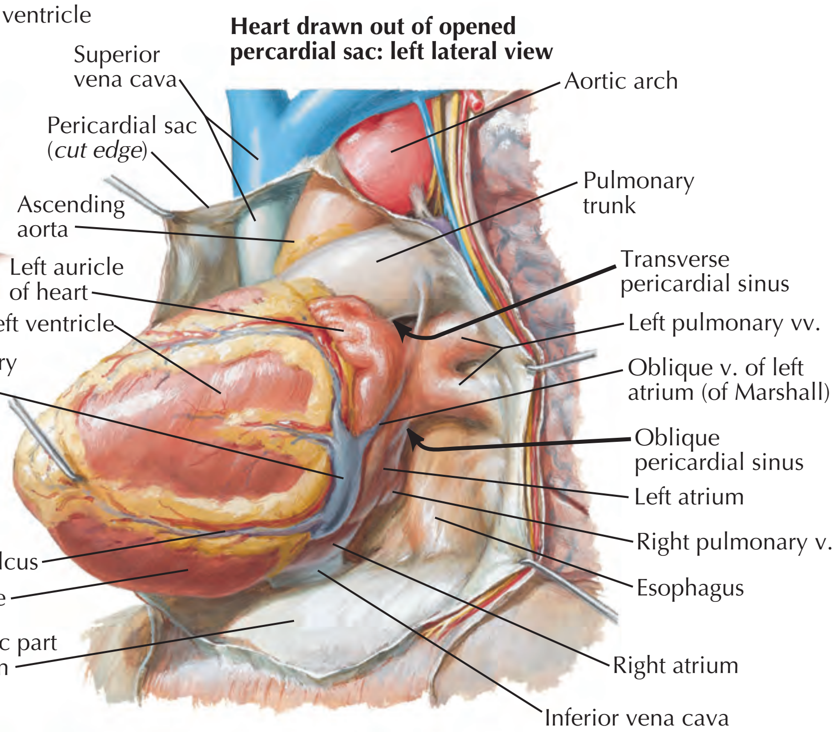


Left subclavian a.
Left common carotid a.
Left pulmonary a.
Left superior pulmonary v.
Left auricle of heart
Left inferior pulmonary v.
Oblique v. of left atrium (of Marshall)
Left atrium
Attachment of pericardial sac
Coronary sinus
Left ventricle
Apex of heart
Brachiocephalic trunk
Superior vena cava
Aortic arch
Right pulmonary a.
Right superior pulmonary v.
Right inferior pulmonary v.
Sulcus terminalis
Right atrium
Inferior vena cava
Right coronary a.
Coronary sulcus
Inferior interventricular a. (posterior descending a.)
Middle cardiac v.
Right ventricle
Inferior interventricular sulcus

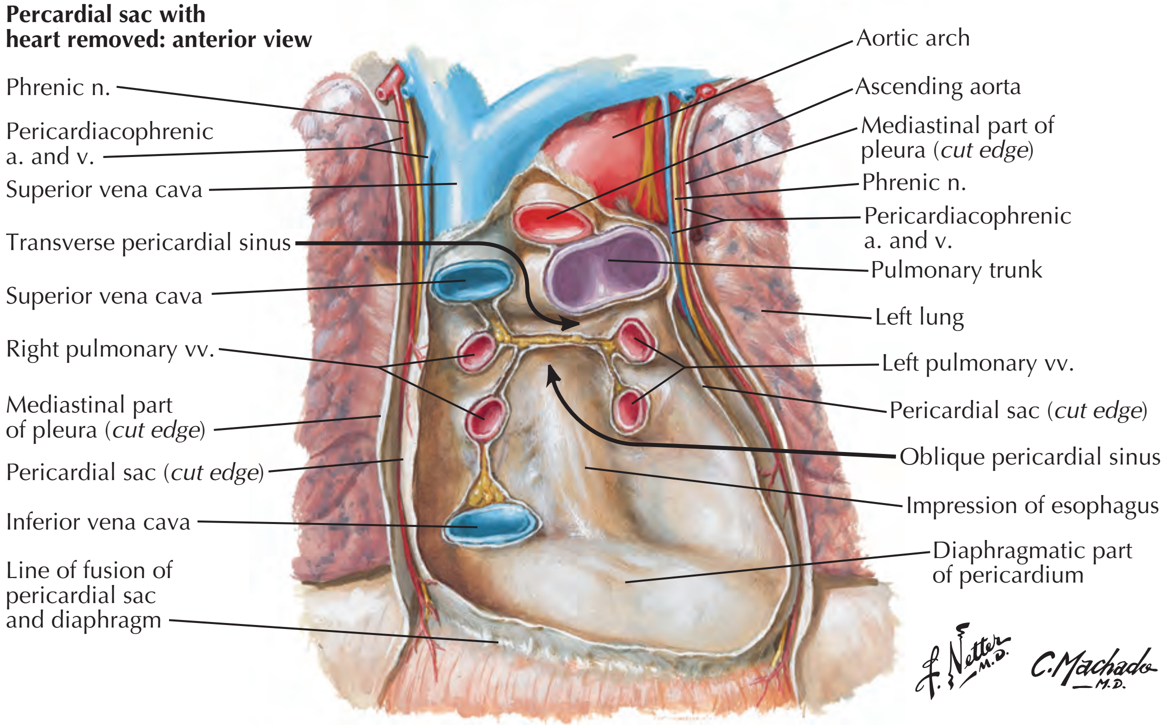
Base and diaphragmatic surface: posteroinferior view


Coronal view

Superior vena cava
Parietal layer of serous pericardium
Visceral layer of serous pericardium
Pericardial cavity
Right atrium
Aortic valve
Right atrioventricular valve (tricuspid valve)
Right ventricle
Pulmonary trunk
Left auricle of heart
Left atrioventricular valve (mitral valve)
Left ventricle
🟦 Fibrous pericardium
🟥 Serous pericardium

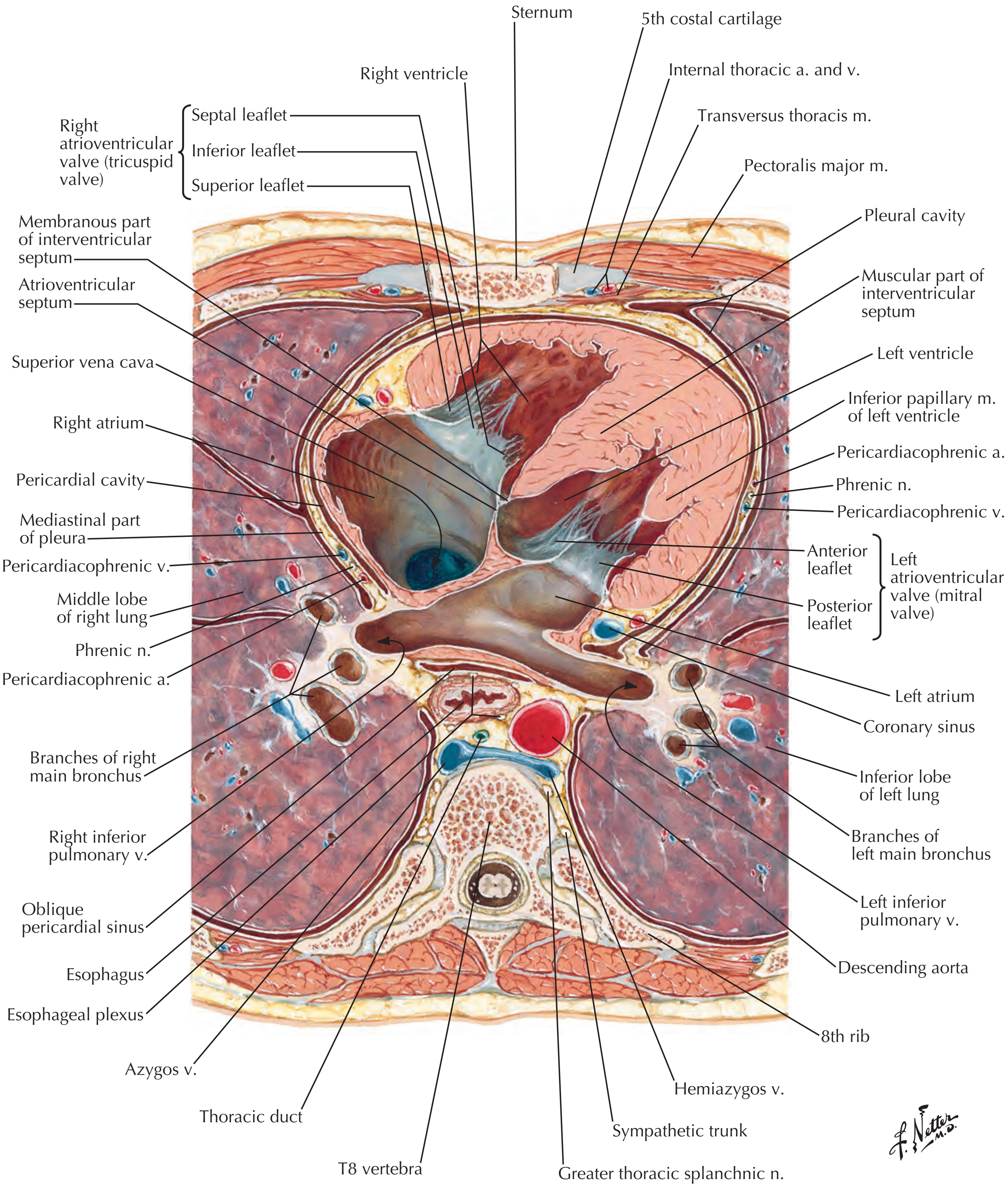

Heart drawn out of opened percardial sac: left lateral view

Superior vena cava
Pericardial sac (*cut edge*)
Ascending aorta
Left auricle of heart
Left ventricle
Coronary sinus
Inferior inter-ventricular sulcus
Right ventricle
Diaphragmatic part of pericardium
Aortic arch
Pulmonary trunk
Transverse pericardial sinus
Left pulmonary vv.
Oblique v. of left atrium (of Marshall)
Oblique pericardial sinus
Left atrium
Right pulmonary v.
Esophagus
Right atrium
Inferior vena cava


Percardial sac with heart removed: anterior view

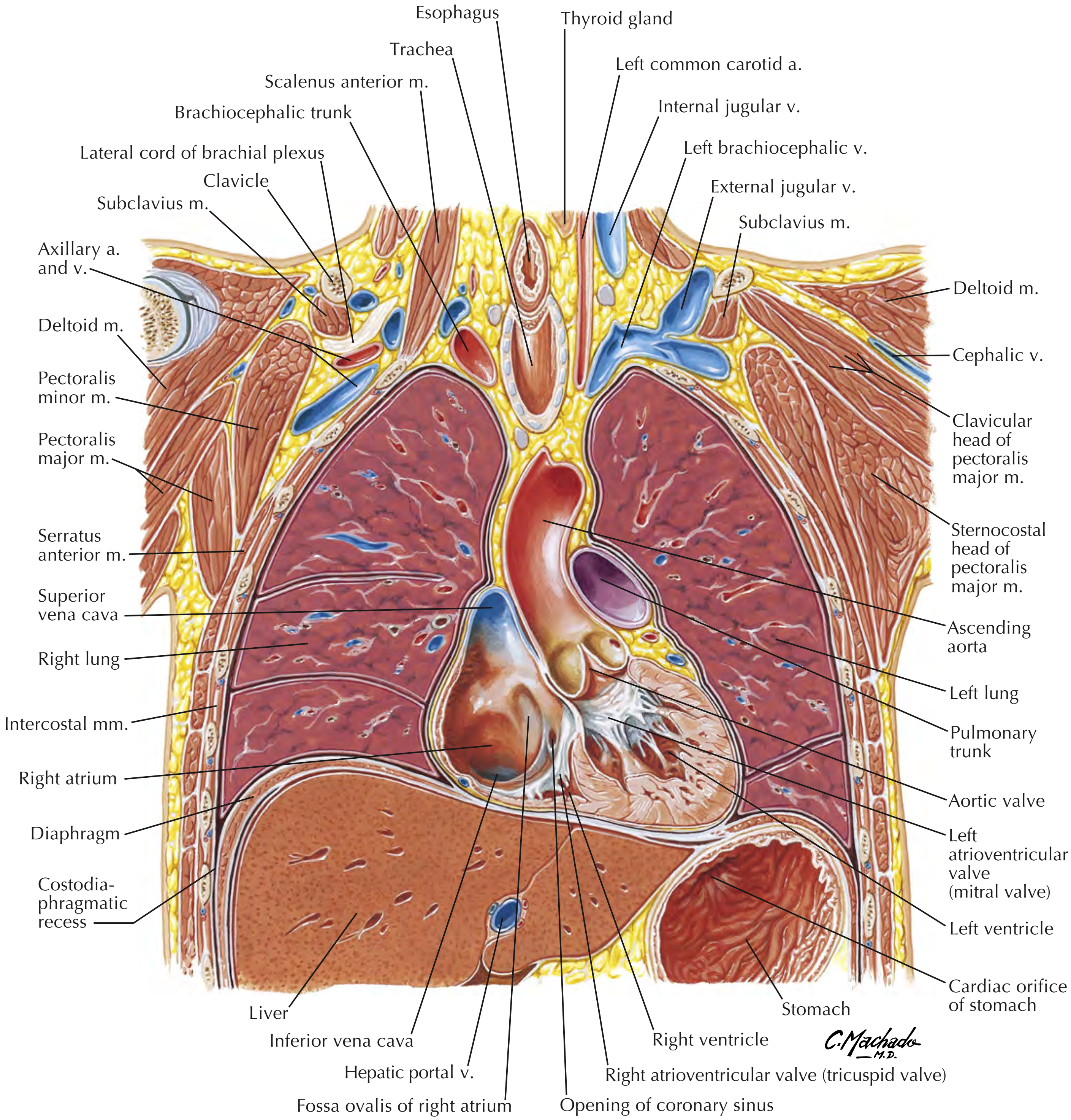
Phrenic n.
Pericardiacophrenic a. and v.
Superior vena cava
Transverse pericardial sinus
Superior vena cava
Right pulmonary vv.
Mediastinal part of pleura (*cut edge*)
Pericardial sac (*cut edge*)
Inferior vena cava
Line of fusion of pericardial sac and diaphragm
Aortic arch
Ascending aorta
Mediastinal part of pleura (*cut edge*)
Phrenic n.
Pericardiacophrenic a. and v.
Pulmonary trunk
Left lung
Left pulmonary vv.
Pericardial sac (*cut edge*)
Oblique pericardial sinus
Impression of esophagus
Diaphragmatic part of pericardium
F. Netter M.D.
C.Machado M.D.

Mediastinum: Cross Section


Sternum
5th costal cartilage
Right ventricle
Internal thoracic a. and v.
Transversus thoracis m.
Pectoralis major m.
Right atrioventricular valve (tricuspid valve)
Septal leaflet
Inferior leaflet
Superior leaflet
Membranous part of interventricular septum
Atrioventricular septum
Superior vena cava
Right atrium
Pericardial cavity
Mediastinal part of pleura
Pericardiacophrenic v.
Middle lobe of right lung
Phrenic n.
Pericardiacophrenic a.
Branches of right main bronchus
Right inferior pulmonary v.
Oblique pericardial sinus
Esophagus
Esophageal plexus
Azygos v.
Thoracic duct
T8 vertebra
Pleural cavity
Muscular part of interventricular septum
Left ventricle
Inferior papillary m. of left ventricle
Pericardiacophrenic a.
Phrenic n.
Pericardiacophrenic v.
Anterior leaflet
Posterior leaflet
Left atrioventricular valve (mitral valve)
Left atrium
Coronary sinus
Inferior lobe of left lung
Branches of left main bronchus
Left inferior pulmonary v.
Descending aorta
8th rib
Hemiazygos v.
Sympathetic trunk
Greater thoracic splanchnic n.

Thorax: Coronal Section of Heart and Ascending Aorta

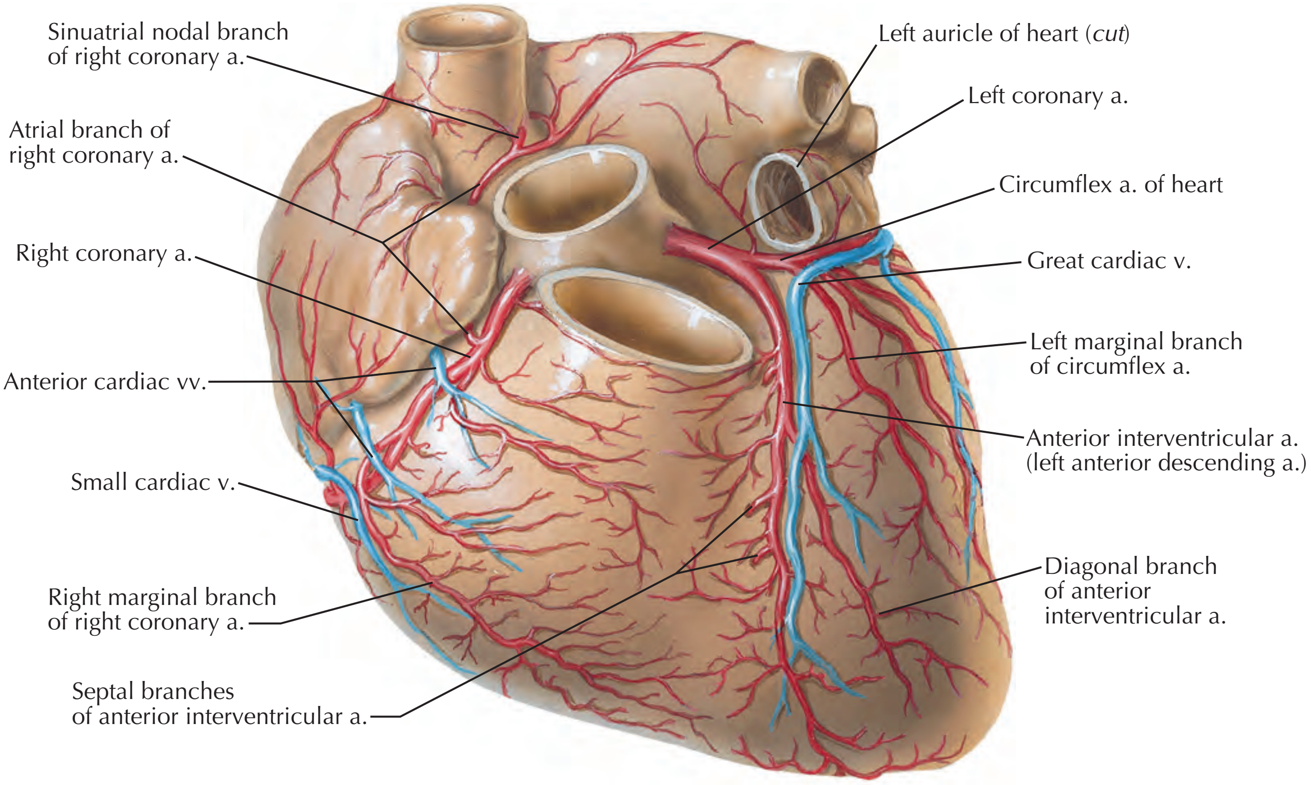
See also **Plate BP 50**


Esophagus
Thyroid gland
Trachea
Left common carotid a.
Scalenus anterior m.
Internal jugular v.
Brachiocephalic trunk
Left brachiocephalic v.
Lateral cord of brachial plexus
External jugular v.
Clavicle
Subclavius m.
Subclavius m.
Axillary a. and v.
Deltoid m.
Deltoid m.
Cephalic v.
Pectoralis minor m.
Clavicular head of pectoralis major m.
Pectoralis major m.
Sternocostal head of pectoralis major m.
Serratus anterior m.
Superior vena cava
Ascending aorta
Right lung
Left lung
Pulmonary trunk
Intercostal mm.
Right atrium
Aortic valve
Diaphragm
Left atrioventricular valve (mitral valve)
Costodiaphragmatic recess
Left ventricle
Cardiac orifice of stomach
Liver
Stomach
Inferior vena cava
Right ventricle
C. Machado M.D.
Hepatic portal v.
Right atrioventricular valve (tricuspid valve)
Fossa ovalis of right atrium
Opening of coronary sinus

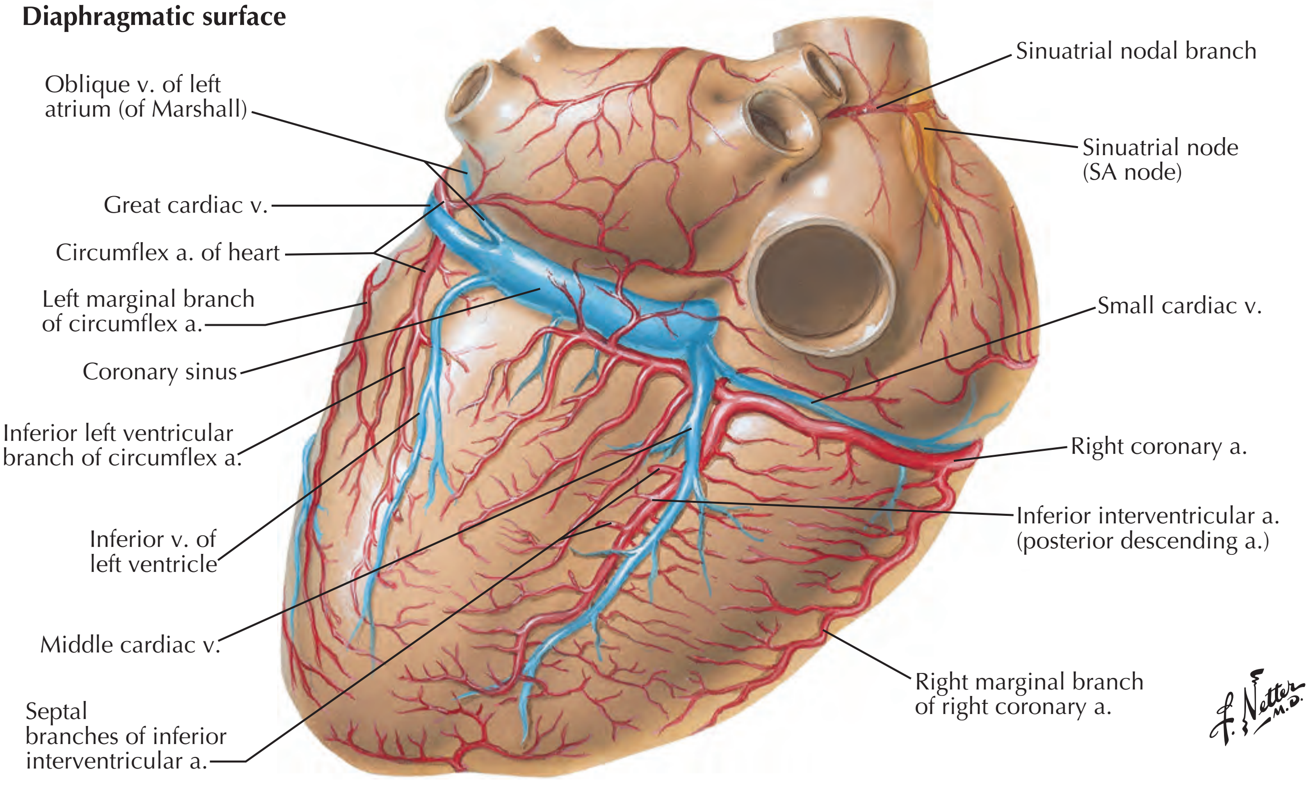
Coronary Arteries and Cardiac Veins

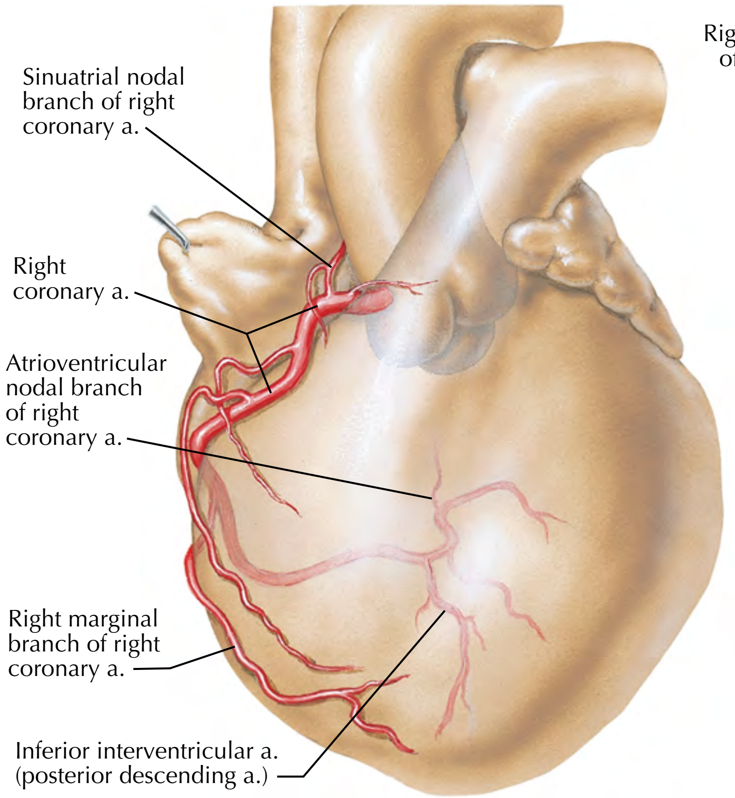
See also **Plate BP 47**

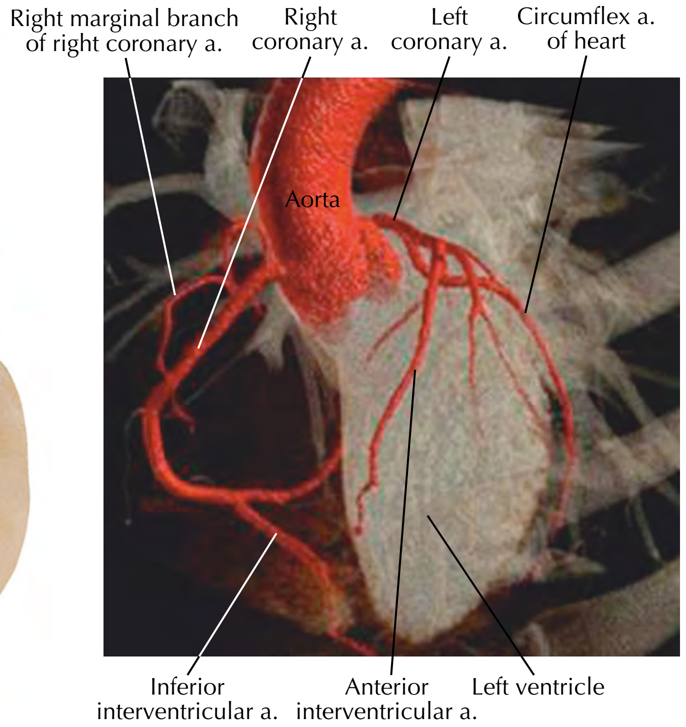
Sternocostal surface

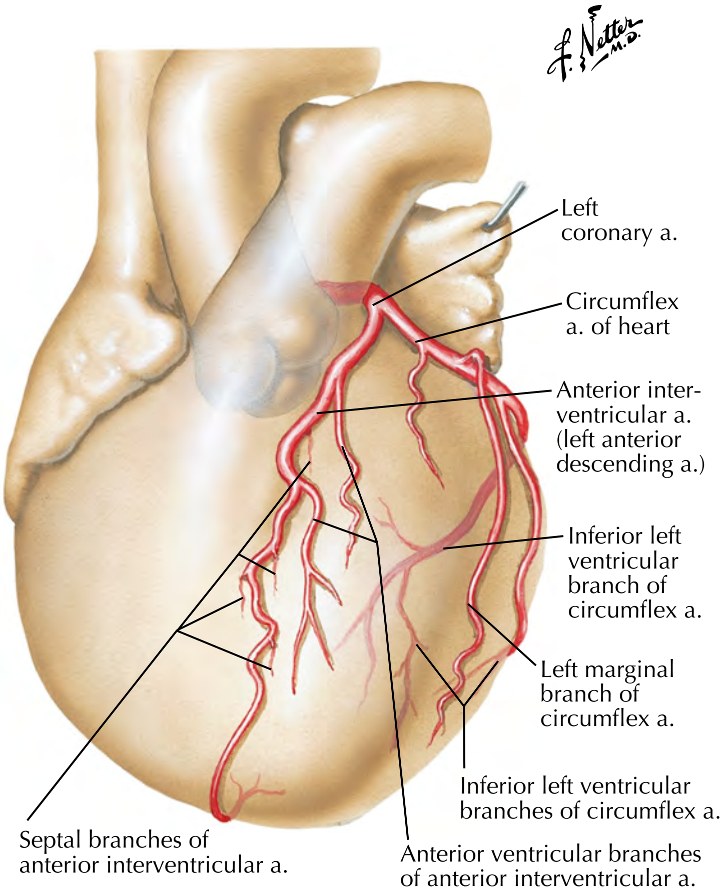

Sinuatrial nodal branch of right coronary a.
Atrial branch of right coronary a.
Right coronary a.
Anterior cardiac vv.
Small cardiac v.
Right marginal branch of right coronary a.
Septal branches of anterior interventricular a.
Left auricle of heart (*cut*)
Left coronary a.
Circumflex a. of heart
Great cardiac v.
Left marginal branch of circumflex a.
Anterior interventricular a. (left anterior descending a.)
Diagonal branch of anterior interventricular a.

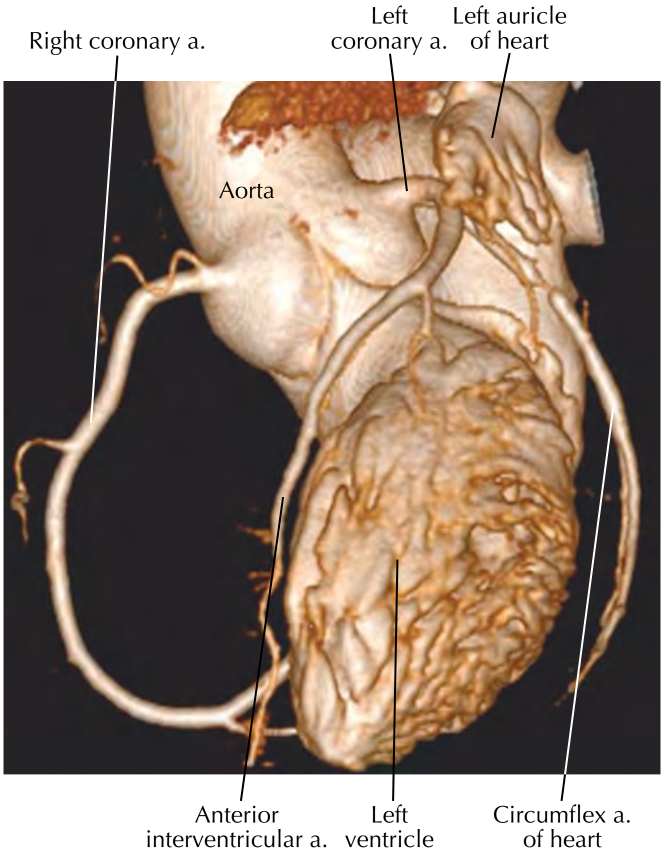
Diaphragmatic surface


Oblique v. of left atrium (of Marshall)
Great cardiac v.
Circumflex a. of heart
Left marginal branch of circumflex a.
Coronary sinus
Inferior left ventricular branch of circumflex a.
Inferior v. of left ventricle
Middle cardiac v.
Septal branches of inferior interventricular a.
Sinuatrial nodal branch
Sinuatrial node (SA node)
Small cardiac v.
Right coronary a.
Inferior interventricular a. (posterior descending a.)
Right marginal branch of right coronary a.


Sinuatrial nodal branch of right coronary a.
Right coronary a.
Atrioventricular nodal branch of right coronary a.
Right marginal branch of right coronary a.
Inferior interventricular a. (posterior descending a.)

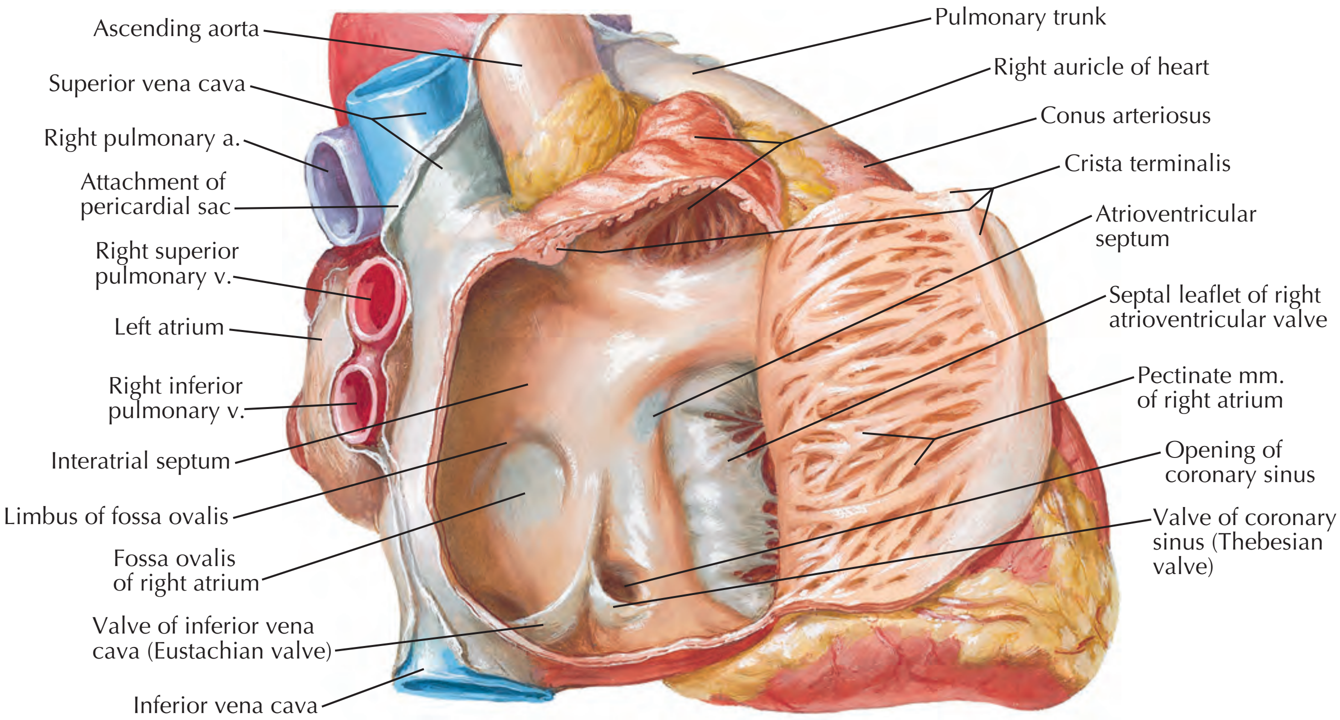

Right marginal branch of right coronary a.
Right coronary a.
Left coronary a.
Circumflex a. of heart
Aorta
Inferior interventricular a.
Anterior interventricular a.
Left ventricle


F. Netter M.D.
Left coronary a.
Circumflex a. of heart
Anterior interventricular a. (left anterior descending a.)
Inferior left ventricular branch of circumflex a.
Left marginal branch of circumflex a.
Inferior left ventricular branches of circumflex a.
Septal branches of anterior interventricular a.
Anterior ventricular branches of anterior interventricular a.

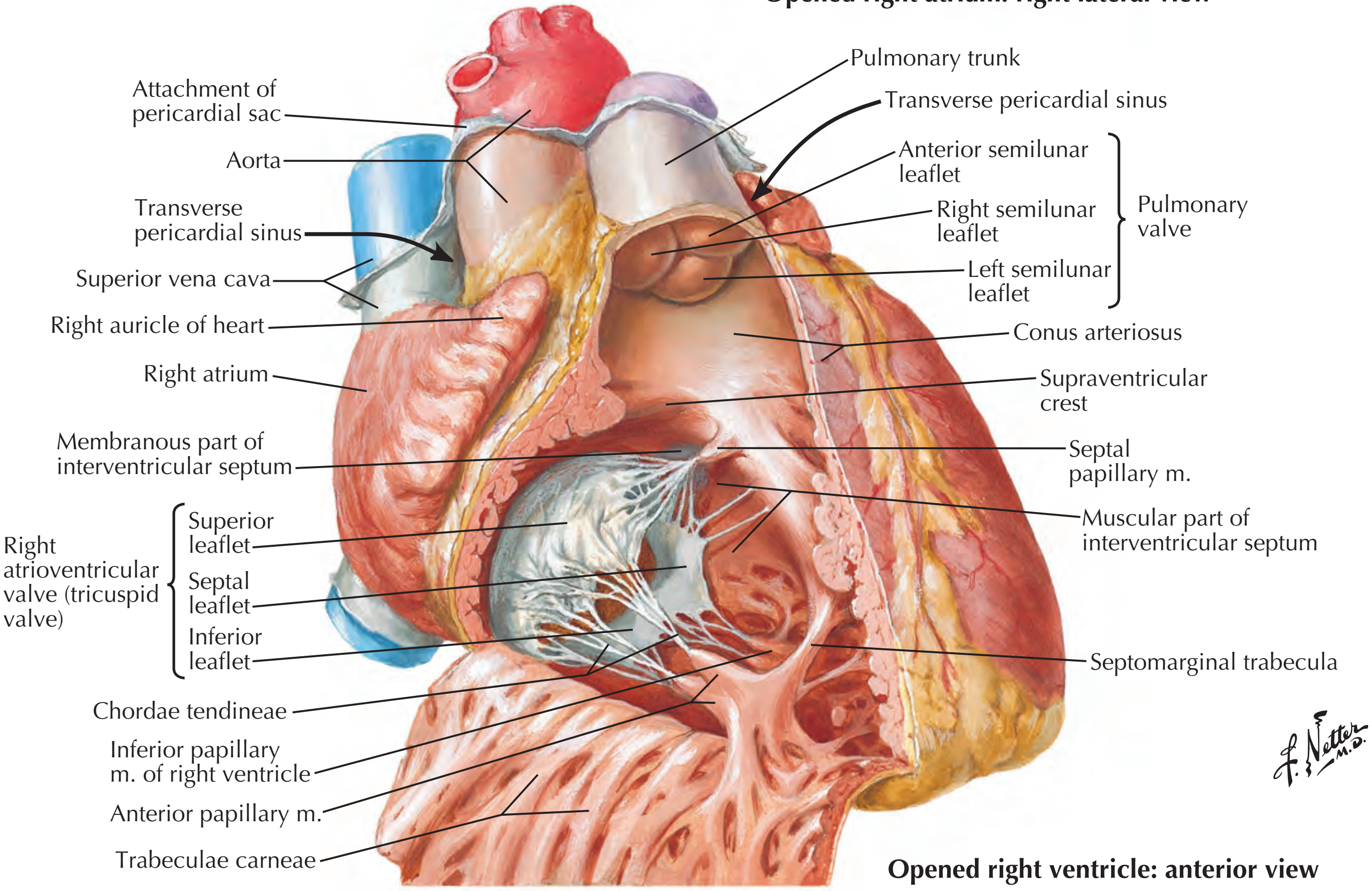

Right coronary a.
Left coronary a.
Left auricle of heart
Aorta
Anterior interventricular a.
Left ventricle
Circumflex a. of heart

Right Atrium and Ventricle

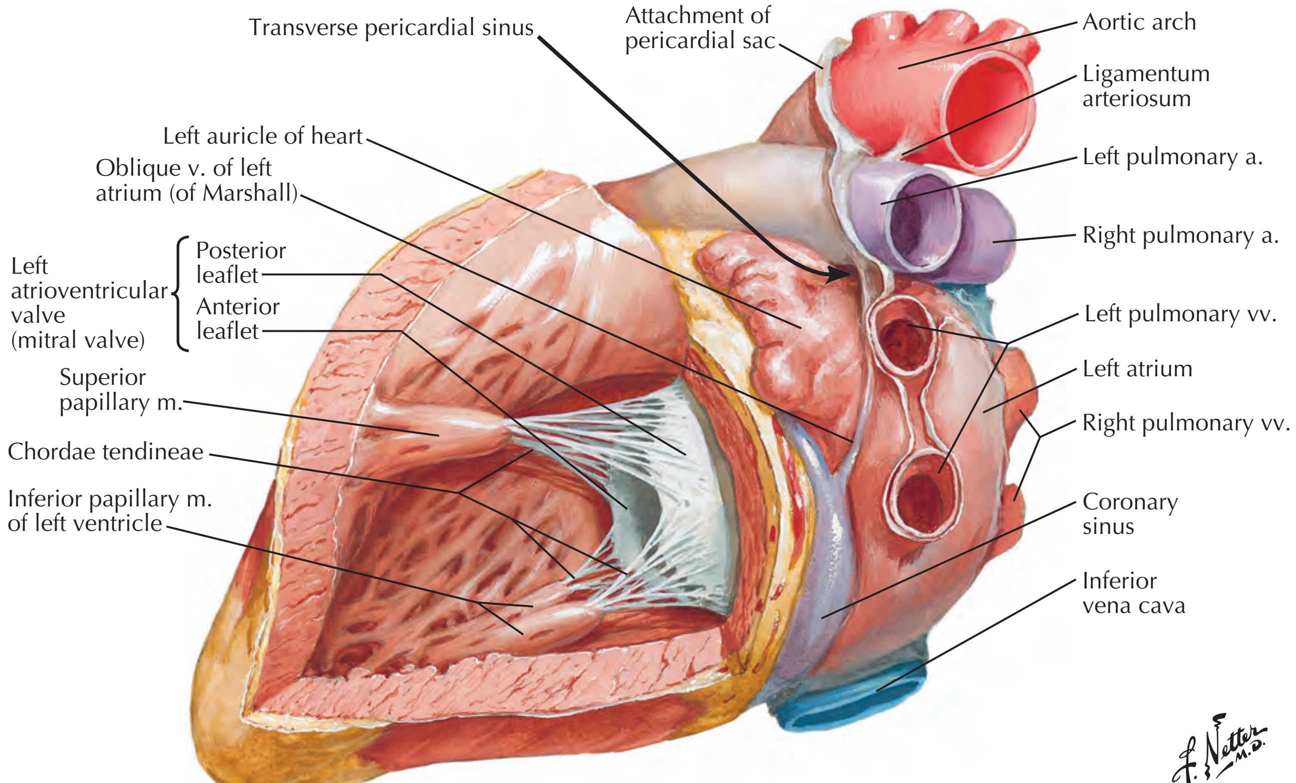
See also **Plate 246**


Ascending aorta
Superior vena cava
Right pulmonary a.
Attachment of pericardial sac
Right superior pulmonary v.
Left atrium
Right inferior pulmonary v.
Interatrial septum
Limbus of fossa ovalis
Fossa ovalis of right atrium
Valve of inferior vena cava (Eustachian valve)
Inferior vena cava
Pulmonary trunk
Right auricle of heart
Conus arteriosus
Crista terminalis
Atrioventricular septum
Septal leaflet of right atrioventricular valve
Pectinate mm. of right atrium
Opening of coronary sinus
Valve of coronary sinus (Thebesian valve)

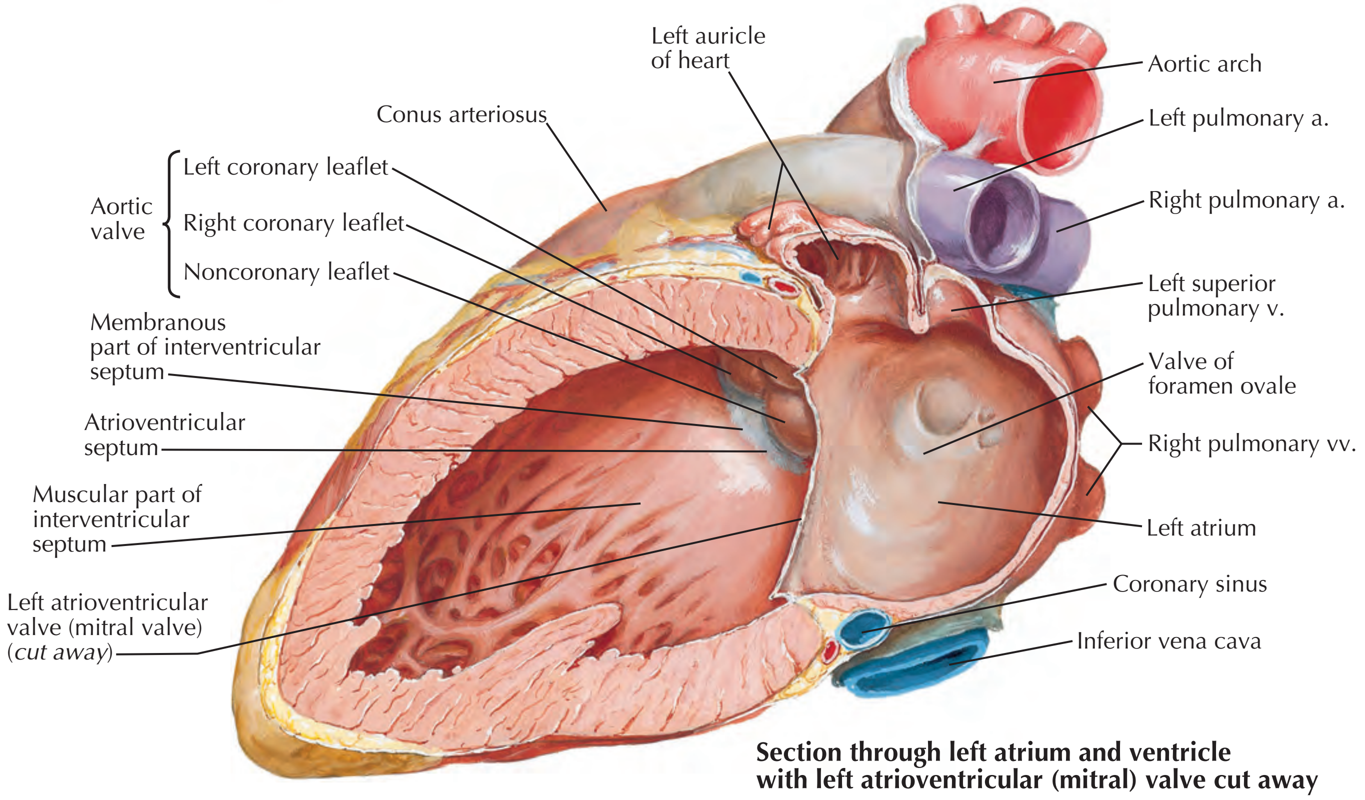
Opened right atrium: right lateral view


Attachment of pericardial sac
Aorta
Transverse pericardial sinus
Superior vena cava
Right auricle of heart
Right atrium
Membranous part of interventricular septum
Right atrioventricular valve (tricuspid valve)
Superior leaflet
Septal leaflet
Inferior leaflet
Chordae tendineae
Inferior papillary m. of right ventricle
Anterior papillary m.
Trabeculae carneae
Pulmonary trunk
Transverse pericardial sinus
Anterior semilunar leaflet
Right semilunar leaflet
Left semilunar leaflet
Pulmonary valve
Conus arteriosus
Supraventricular crest
Septal papillary m.
Muscular part of interventricular septum
Septomarginal trabecula

Opened right ventricle: anterior view

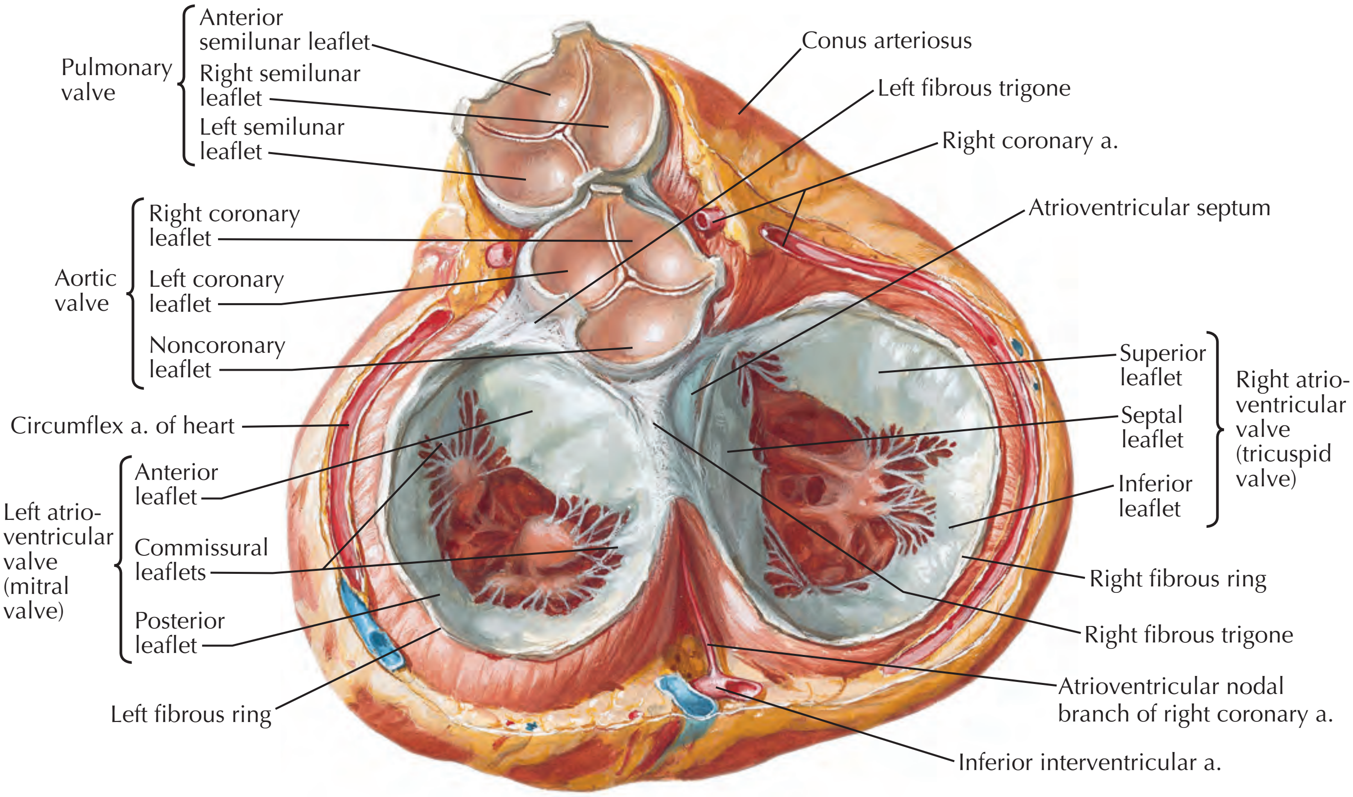

Transverse pericardial sinus
Attachment of pericardial sac
Aortic arch
Ligamentum arteriosum
Left pulmonary a.
Right pulmonary a.
Left pulmonary vv.
Left atrium
Right pulmonary vv.
Coronary sinus
Inferior vena cava
Left auricle of heart
Oblique v. of left atrium (of Marshall)
Left atrioventricular valve (mitral valve)
Posterior leaflet
Anterior leaflet
Superior papillary m.
Chordae tendineae
Inferior papillary m. of left ventricle
F. Netter M.D.

Flap opened in inferolateral wall of left ventricle

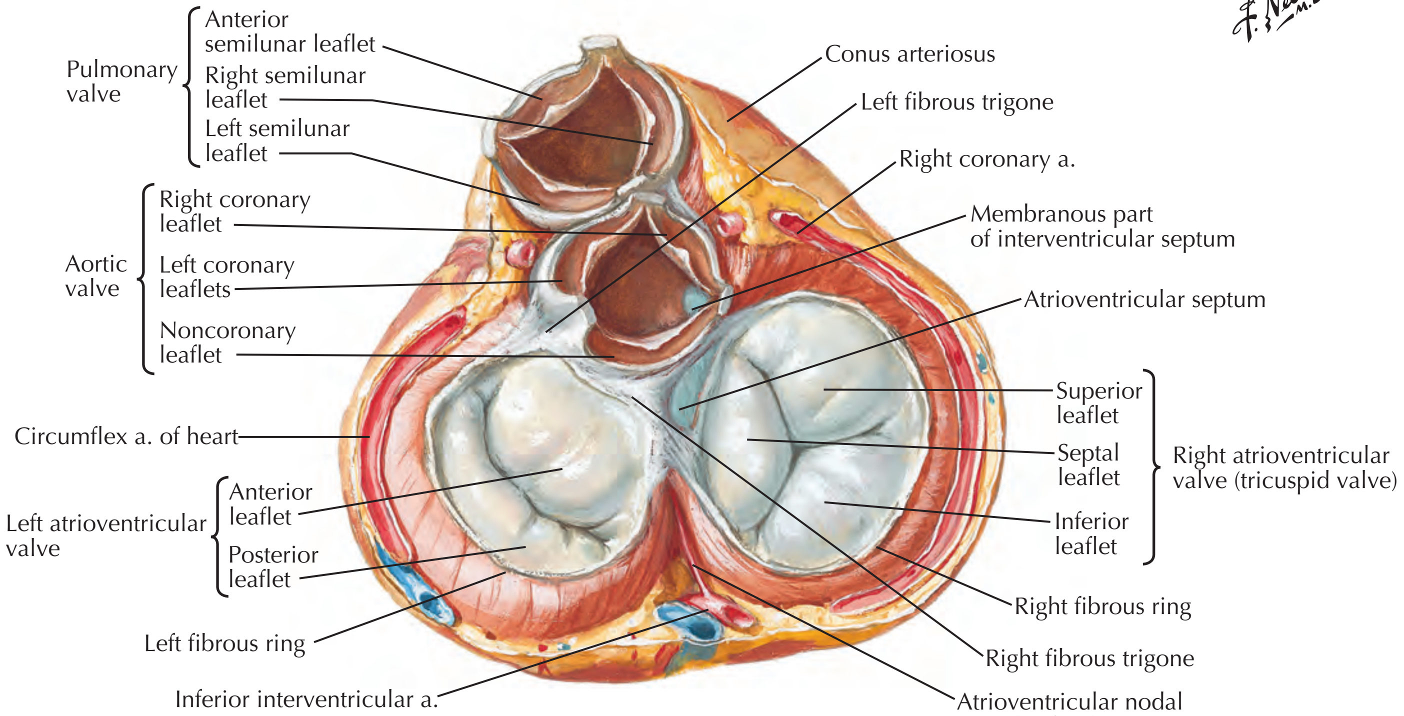

Left auricle of heart
Conus arteriosus
Aortic arch
Left pulmonary a.
Right pulmonary a.
Left superior pulmonary v.
Valve of foramen ovale
Right pulmonary vv.
Left atrium
Coronary sinus
Inferior vena cava
Aortic valve
Left coronary leaflet
Right coronary leaflet
Noncoronary leaflet
Membranous part of interventricular septum
Atrioventricular septum
Muscular part of interventricular septum
Left atrioventricular valve (mitral valve) (*cut away*)

Section through left atrium and ventricle with left atrioventricular (mitral) valve cut away

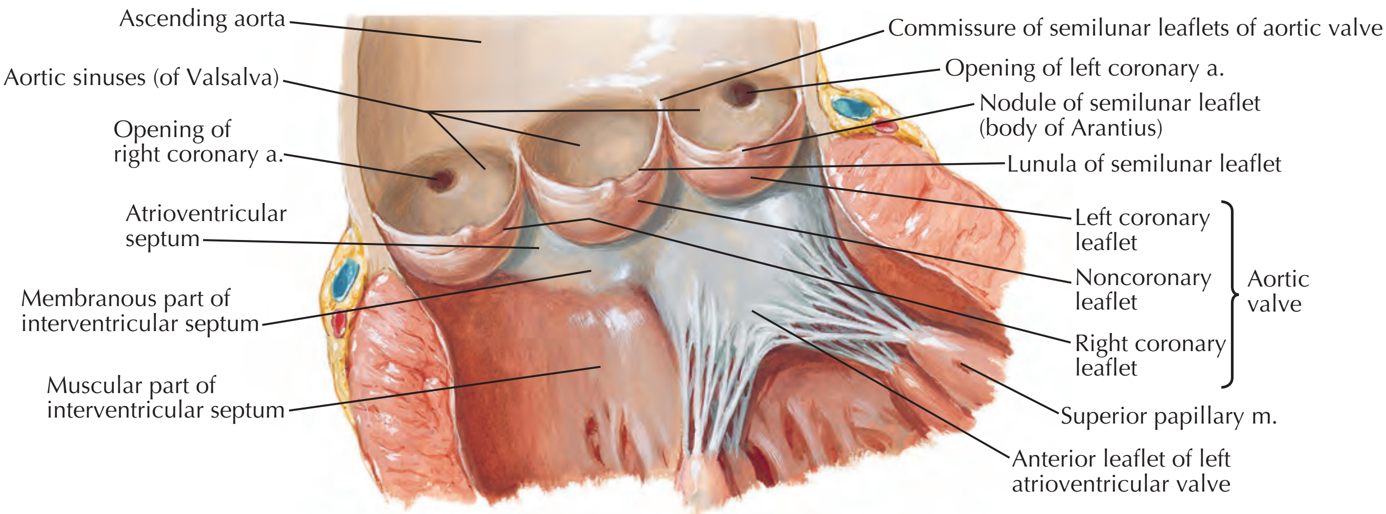
Valvular Complex of Heart


Pulmonary valve
Anterior semilunar leaflet
Right semilunar leaflet
Left semilunar leaflet
Conus arteriosus
Left fibrous trigone
Right coronary a.
Atrioventricular septum
Aortic valve
Right coronary leaflet
Left coronary leaflet
Noncoronary leaflet
Circumflex a. of heart
Left atrio-ventricular valve (mitral valve)
Anterior leaflet
Commissural leaflets
Posterior leaflet
Left fibrous ring
Superior leaflet
Septal leaflet
Inferior leaflet
Right atrio-ventricular valve (tricuspid valve)
Right fibrous ring
Right fibrous trigone
Atrioventricular nodal branch of right coronary a.
Inferior interventricular a.

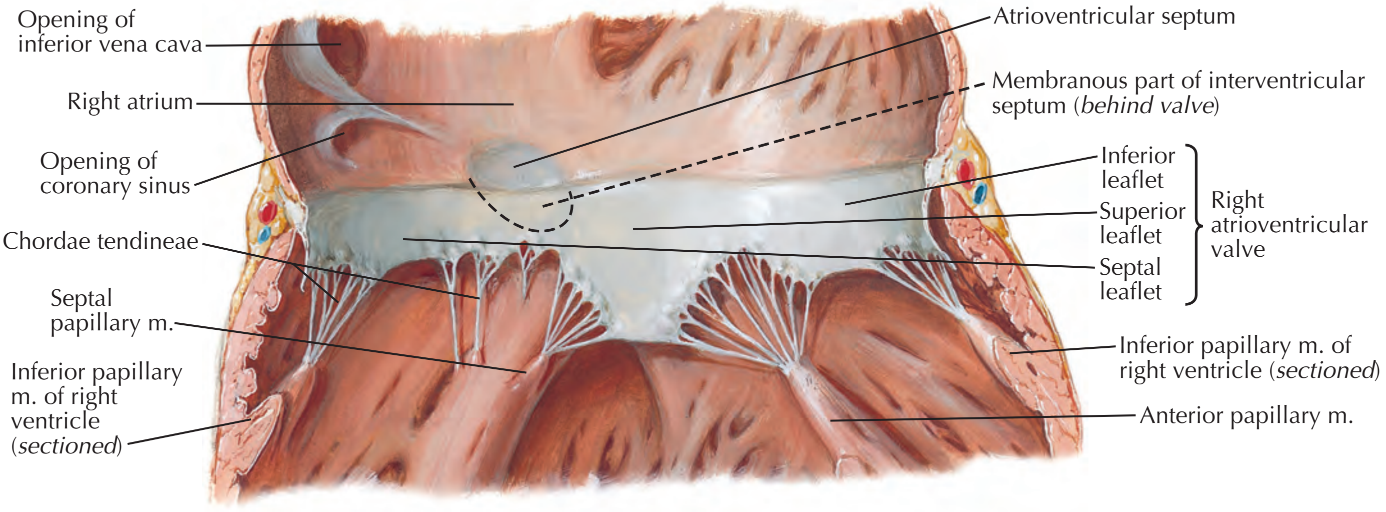
Heart in diastole:
viewed from base with atria removed


Pulmonary valve
Anterior semilunar leaflet
Right semilunar leaflet
Left semilunar leaflet
Conus arteriosus
Left fibrous trigone
Right coronary a.
Membranous part of interventricular septum
Atrioventricular septum
Aortic valve
Right coronary leaflet
Left coronary leaflets
Noncoronary leaflet
Circumflex a. of heart
Left atrioventricular valve
Anterior leaflet
Posterior leaflet
Left fibrous ring
Inferior interventricular a.
Superior leaflet
Septal leaflet
Inferior leaflet
Right atrioventricular valve (tricuspid valve)
Right fibrous ring
Right fibrous trigone
Atrioventricular nodal branch of right coronary a.

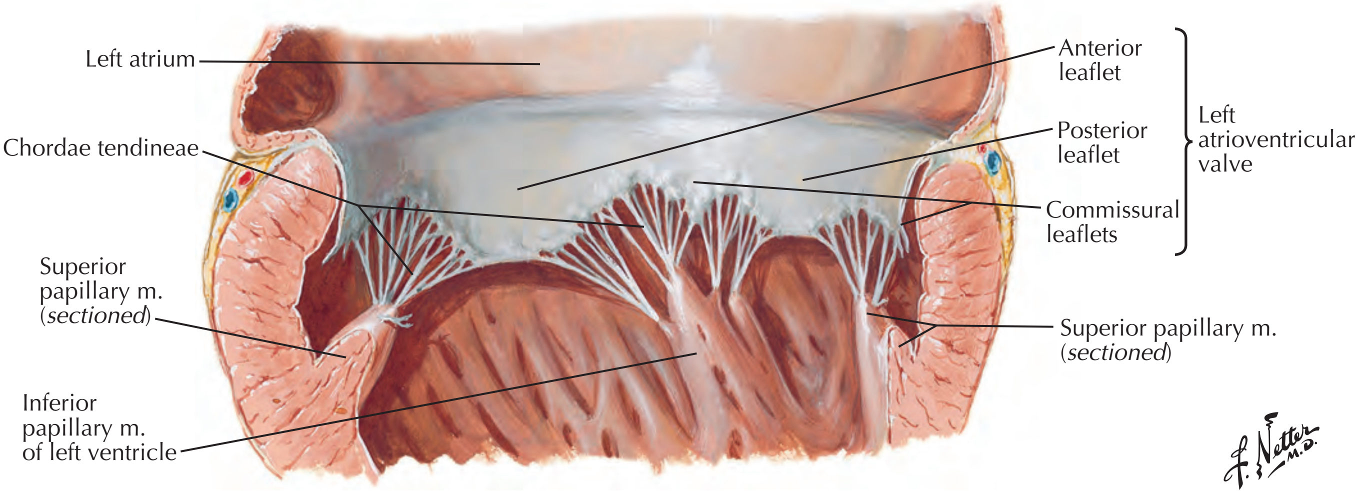
Heart in systole:
viewed from base with atria removed


Ascending aorta
Aortic sinuses (of Valsalva)
Opening of right coronary a.
Atrioventricular septum
Membranous part of interventricular septum
Muscular part of interventricular septum
Commissure of semilunar leaflets of aortic valve
Opening of left coronary a.
Nodule of semilunar leaflet (body of Arantius)
Lunula of semilunar leaflet
Left coronary leaflet
Noncoronary leaflet
Right coronary leaflet
Aortic valve
Superior papillary m.
Anterior leaflet of left atrioventricular valve

Aortic valve

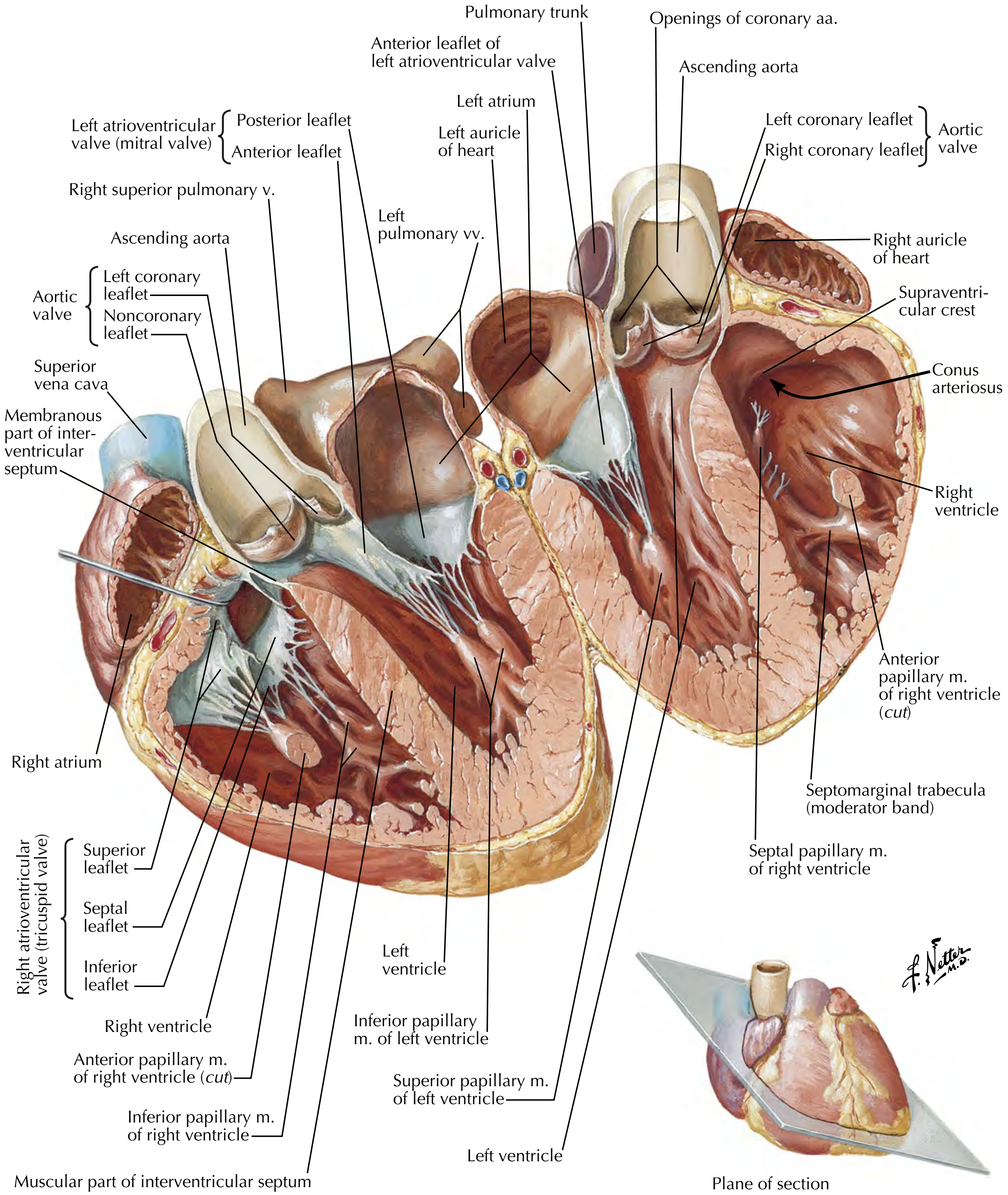

Opening of inferior vena cava
Right atrium
Opening of coronary sinus
Chordae tendineae
Septal papillary m.
Inferior papillary m. of right ventricle (*sectioned*)
Atrioventricular septum
Membranous part of interventricular septum (*behind valve*)
Inferior leaflet
Superior leaflet
Septal leaflet
Right atrioventricular valve
Inferior papillary m. of right ventricle (*sectioned*)
Anterior papillary m.

Right atrioventricular valve (tricuspid valve)

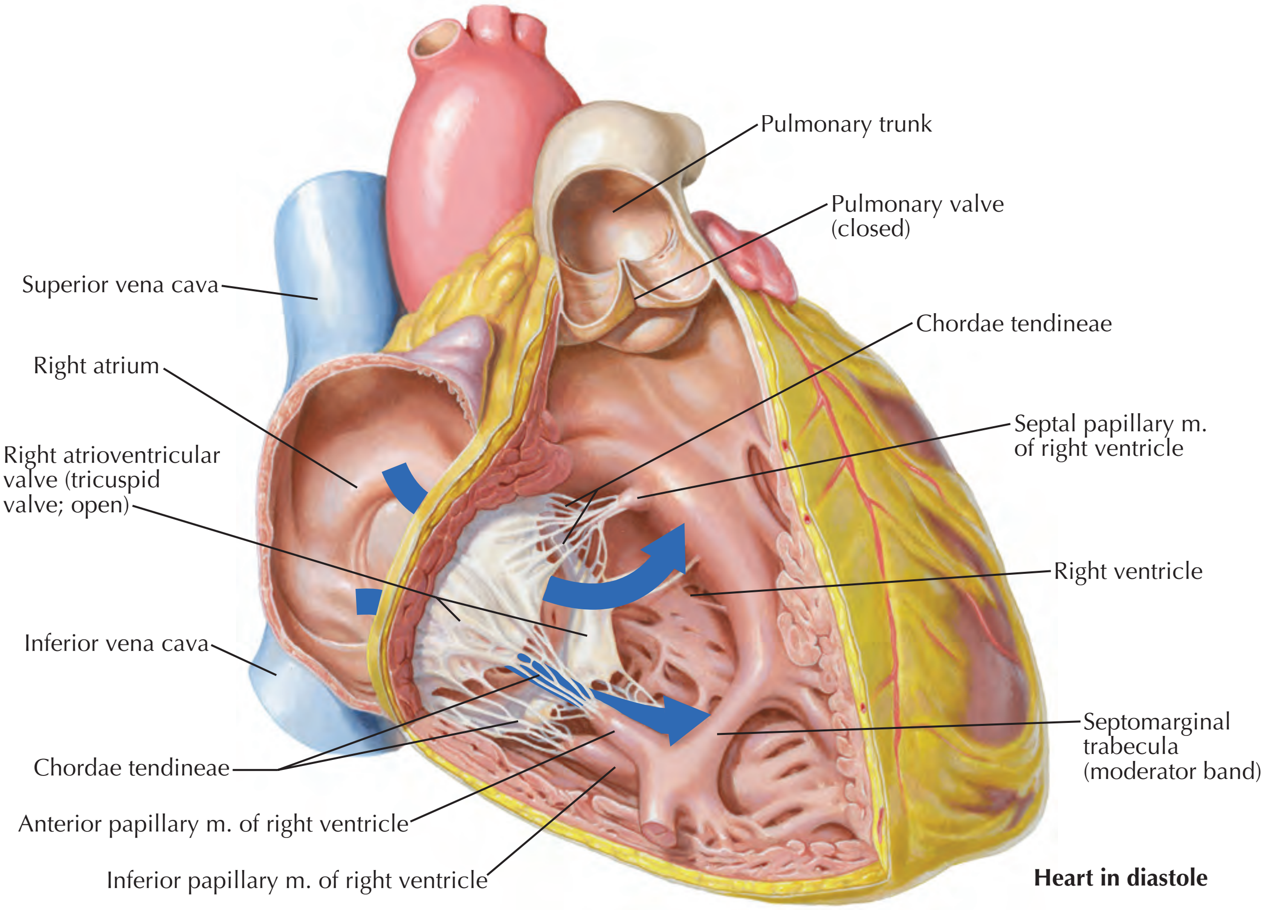

Left atrium
Chordae tendineae
Superior papillary m. (*sectioned*)
Inferior papillary m. of left ventricle
Anterior leaflet
Posterior leaflet
Commissural leaflets
Left atrioventricular valve
Superior papillary m. (*sectioned*)
F. Netter M.D.

Left atrioventricular valve (mitral valve)

Atria, Ventricles, and Interventricular Septum

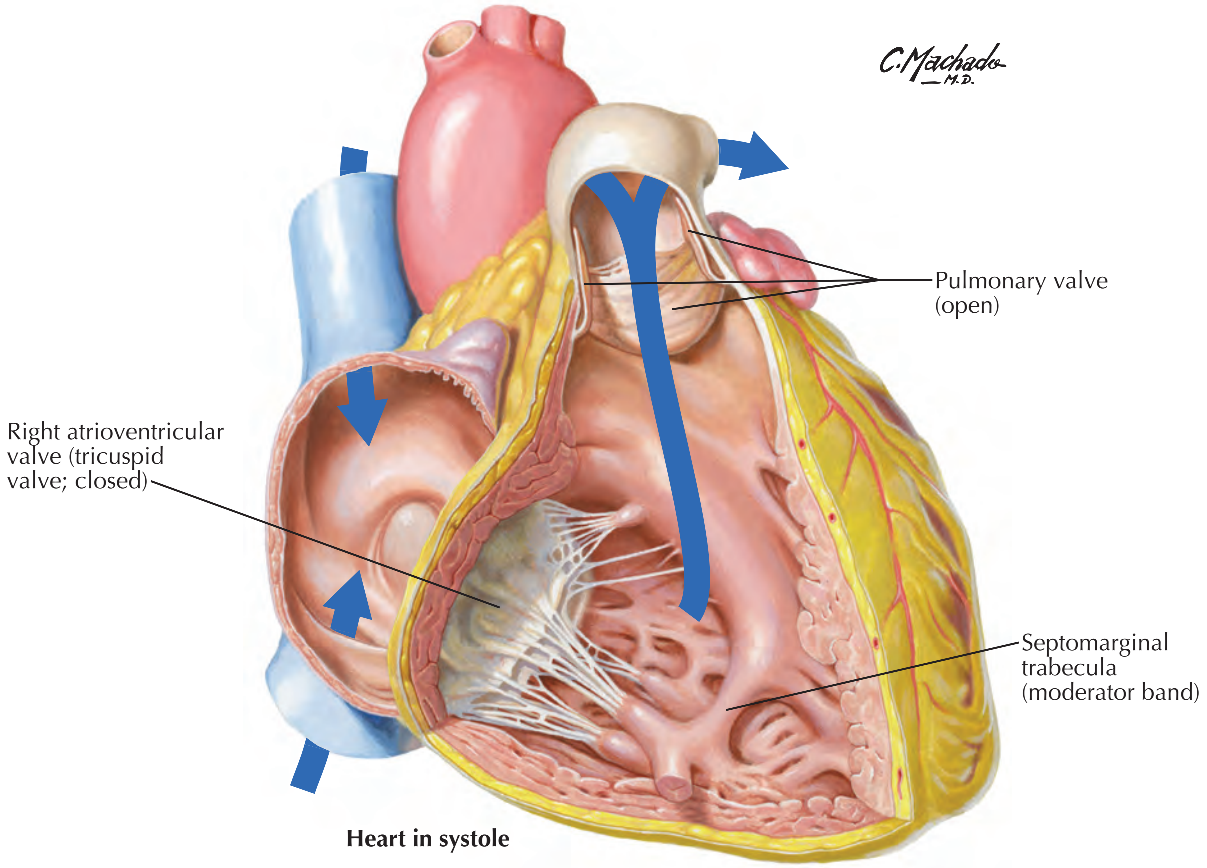

Pulmonary trunk
Openings of coronary aa.
Anterior leaflet of left atrioventricular valve
Ascending aorta
Left atrium
Left atrioventricular valve (mitral valve)
Posterior leaflet
Anterior leaflet
Left auricle of heart
Left coronary leaflet
Right coronary leaflet
Aortic valve
Right superior pulmonary v.
Left pulmonary vv.
Ascending aorta
Right auricle of heart
Aortic valve
Left coronary leaflet
Noncoronary leaflet
Supraventricular crest
Superior vena cava
Conus arteriosus
Membranous part of interventricular septum
Right ventricle
Anterior papillary m. of right ventricle (cut)
Right atrium
Septomarginal trabecula (moderator band)
Septal papillary m. of right ventricle
Right atrioventricular valve (tricuspid valve)
Superior leaflet
Septal leaflet
Inferior leaflet
Left ventricle
Right ventricle
Inferior papillary m. of left ventricle
Anterior papillary m. of right ventricle (cut)
Superior papillary m. of left ventricle
Inferior papillary m. of right ventricle
Left ventricle
Muscular part of interventricular septum
Plane of section

See also **Plate 241**


Pulmonary trunk
Pulmonary valve (closed)
Superior vena cava
Chordae tendineae
Right atrium
Septal papillary m. of right ventricle
Right atrioventricular valve (tricuspid valve; open)
Right ventricle
Inferior vena cava
Septomarginal trabecula (moderator band)
Chordae tendineae
Anterior papillary m. of right ventricle
Inferior papillary m. of right ventricle

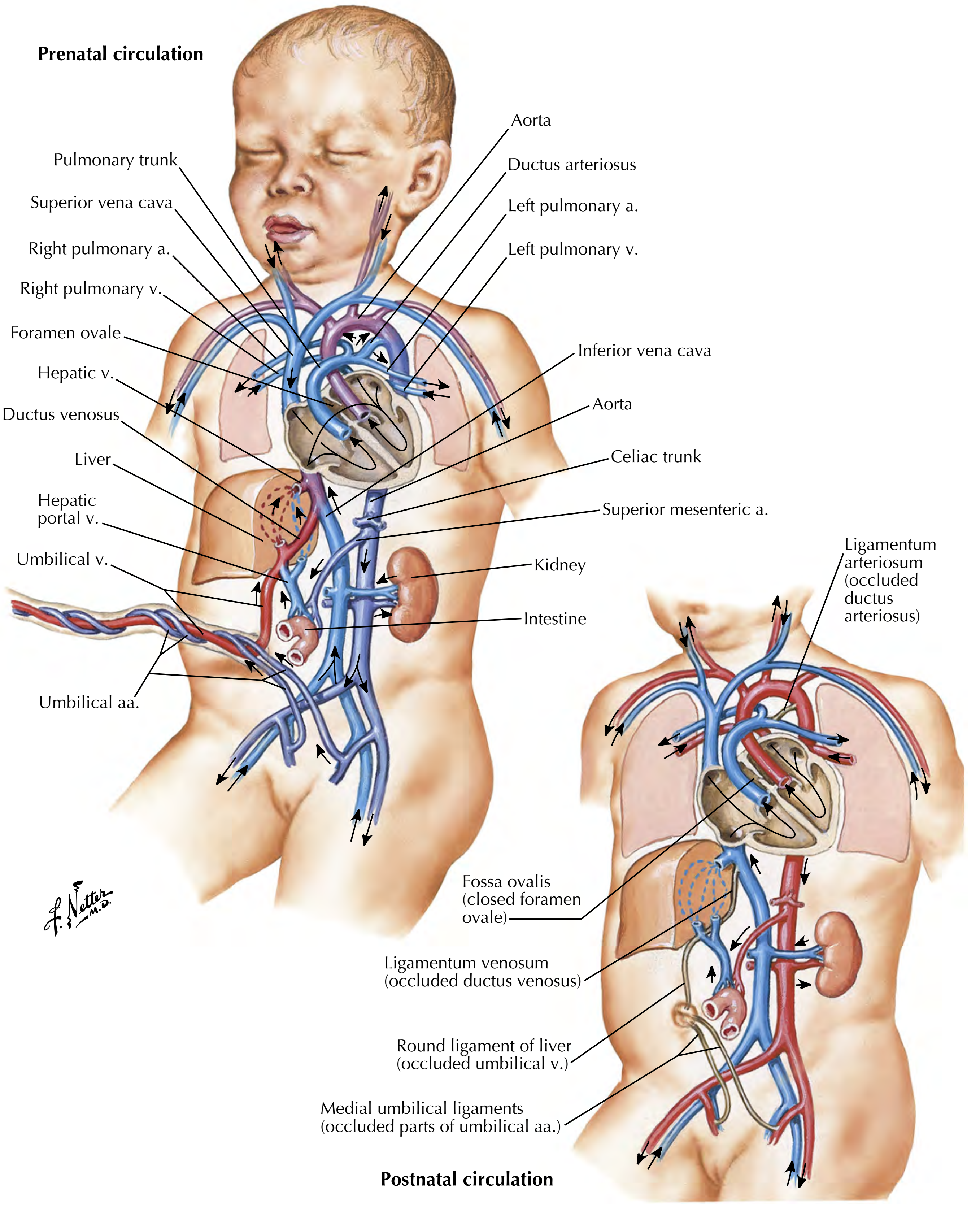
Heart in diastole

C. Machado M.D.


Pulmonary valve (open)
Right atrioventricular valve (tricuspid valve; closed)
Septomarginal trabecula (moderator band)

Heart in systole

Prenatal and Postnatal Circulation



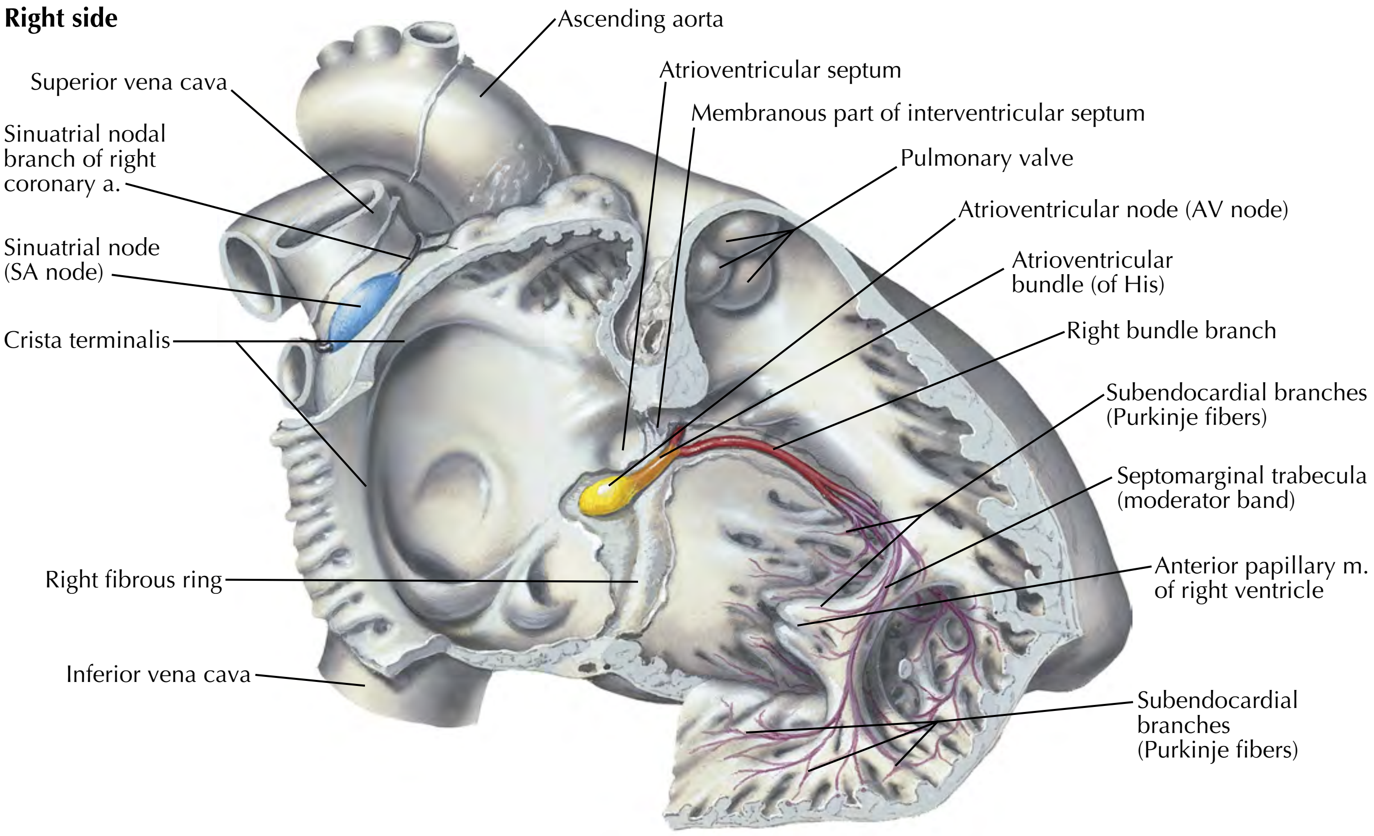
Prenatal circulation

Pulmonary trunk
Superior vena cava
Right pulmonary a.
Right pulmonary v.
Foramen ovale
Hepatic v.
Ductus venosus
Liver
Hepatic portal v.
Umbilical v.
Umbilical aa.
Aorta
Ductus arteriosus
Left pulmonary a.
Left pulmonary v.
Inferior vena cava
Aorta
Celiac trunk
Superior mesenteric a.
Kidney
Intestine

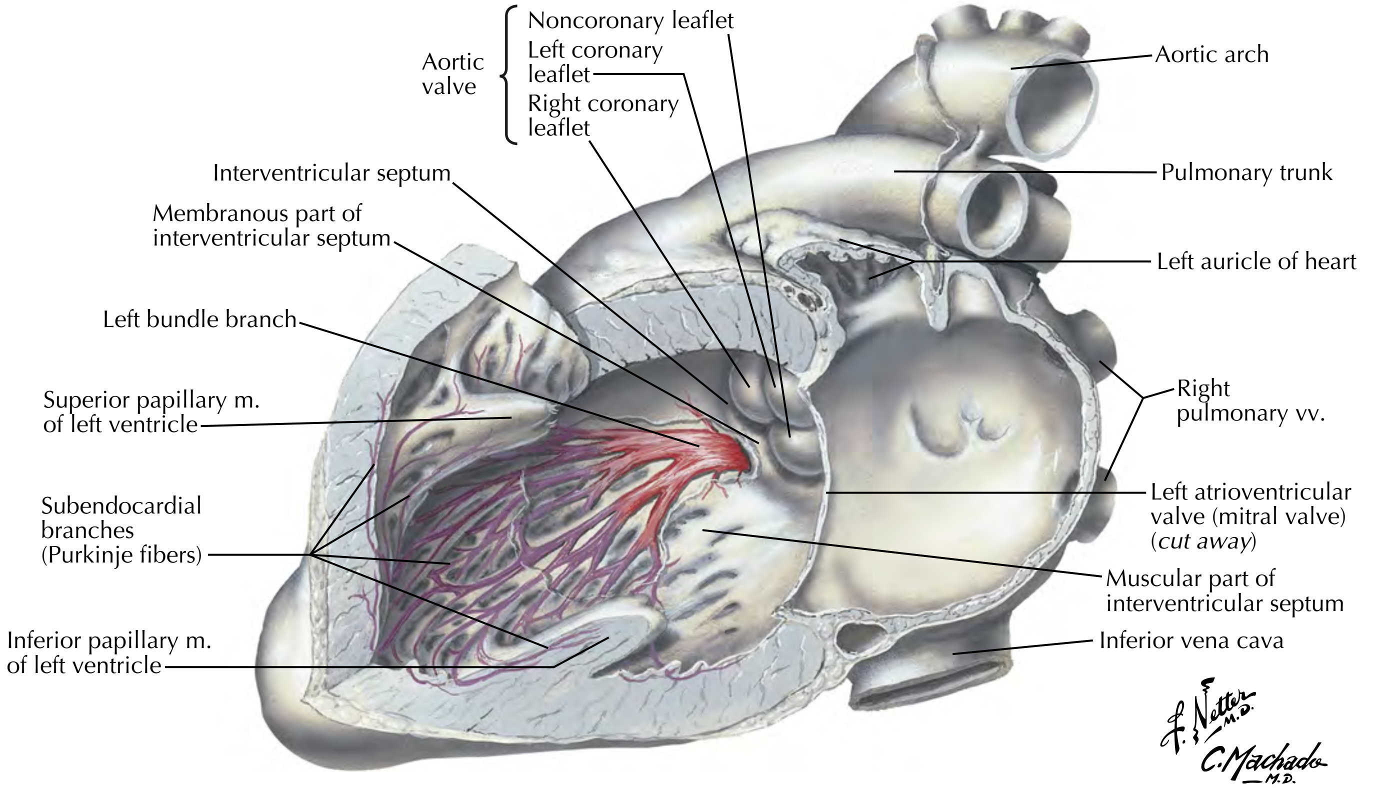
Postnatal circulation

Ligamentum arteriosum (occluded ductus arteriosus)
Fossa ovalis (closed foramen ovale)
Ligamentum venosum (occluded ductus venosus)
Round ligament of liver (occluded umbilical v.)
Medial umbilical ligaments (occluded parts of umbilical aa.)

Right side

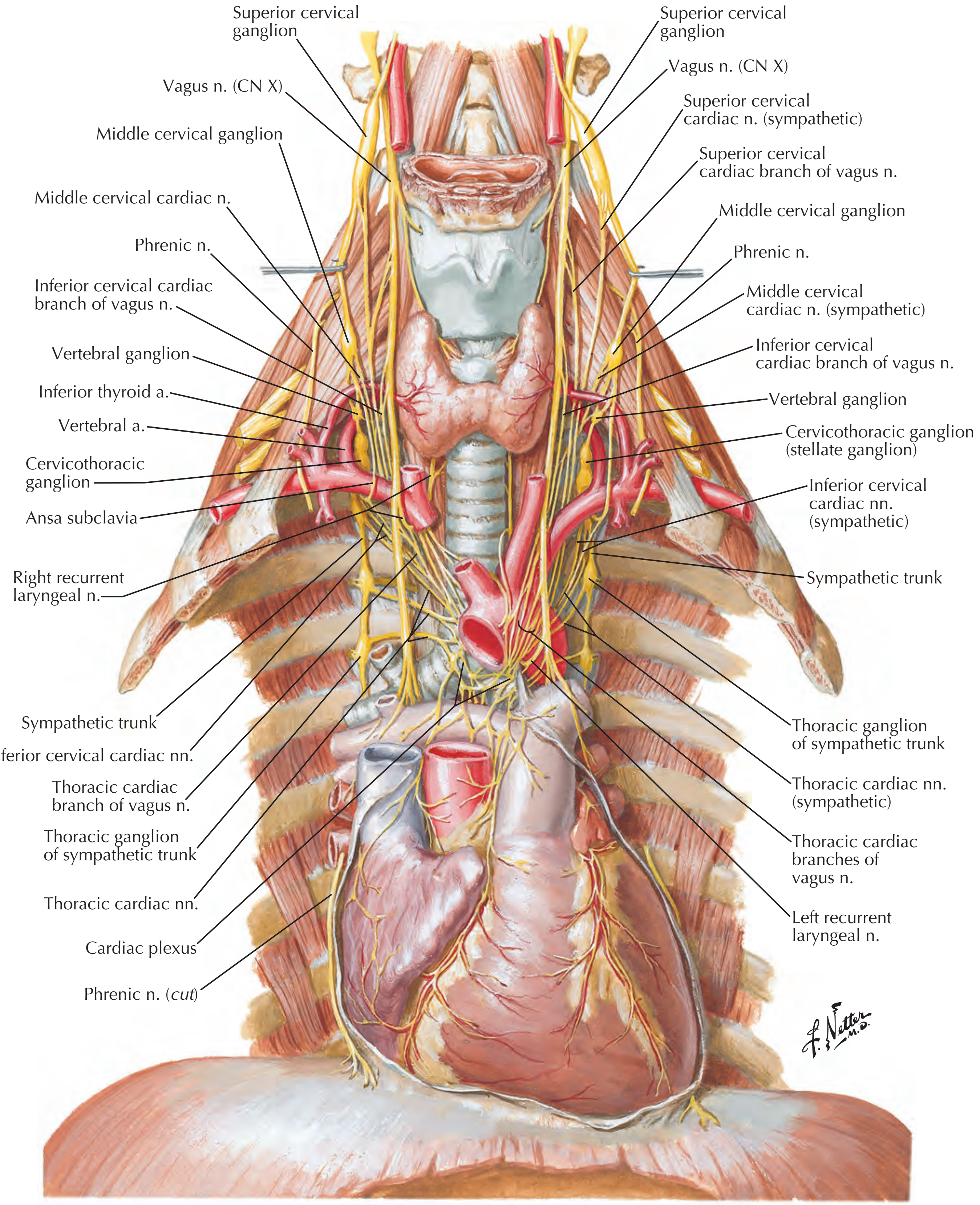

Ascending aorta
Superior vena cava
Atrioventricular septum
Membranous part of interventricular septum
Sinuatrial nodal branch of right coronary a.
Pulmonary valve
Atrioventricular node (AV node)
Sinuatrial node (SA node)
Atrioventricular bundle (of His)
Crista terminalis
Right bundle branch
Subendocardial branches (Purkinje fibers)
Septomarginal trabecula (moderator band)
Right fibrous ring
Anterior papillary m. of right ventricle
Inferior vena cava
Subendocardial branches (Purkinje fibers)

Left side


Aortic valve
Noncoronary leaflet
Left coronary leaflet
Right coronary leaflet
Aortic arch
Interventricular septum
Pulmonary trunk
Membranous part of interventricular septum
Left auricle of heart
Left bundle branch
Superior papillary m. of left ventricle
Right pulmonary vv.
Subendocardial branches (Purkinje fibers)
Left atrioventricular valve (mitral valve) (*cut away*)
Muscular part of interventricular septum
Inferior papillary m. of left ventricle
Inferior vena cava
F. Netter M.D.
C. Machado M.D.

Nerves of Thorax

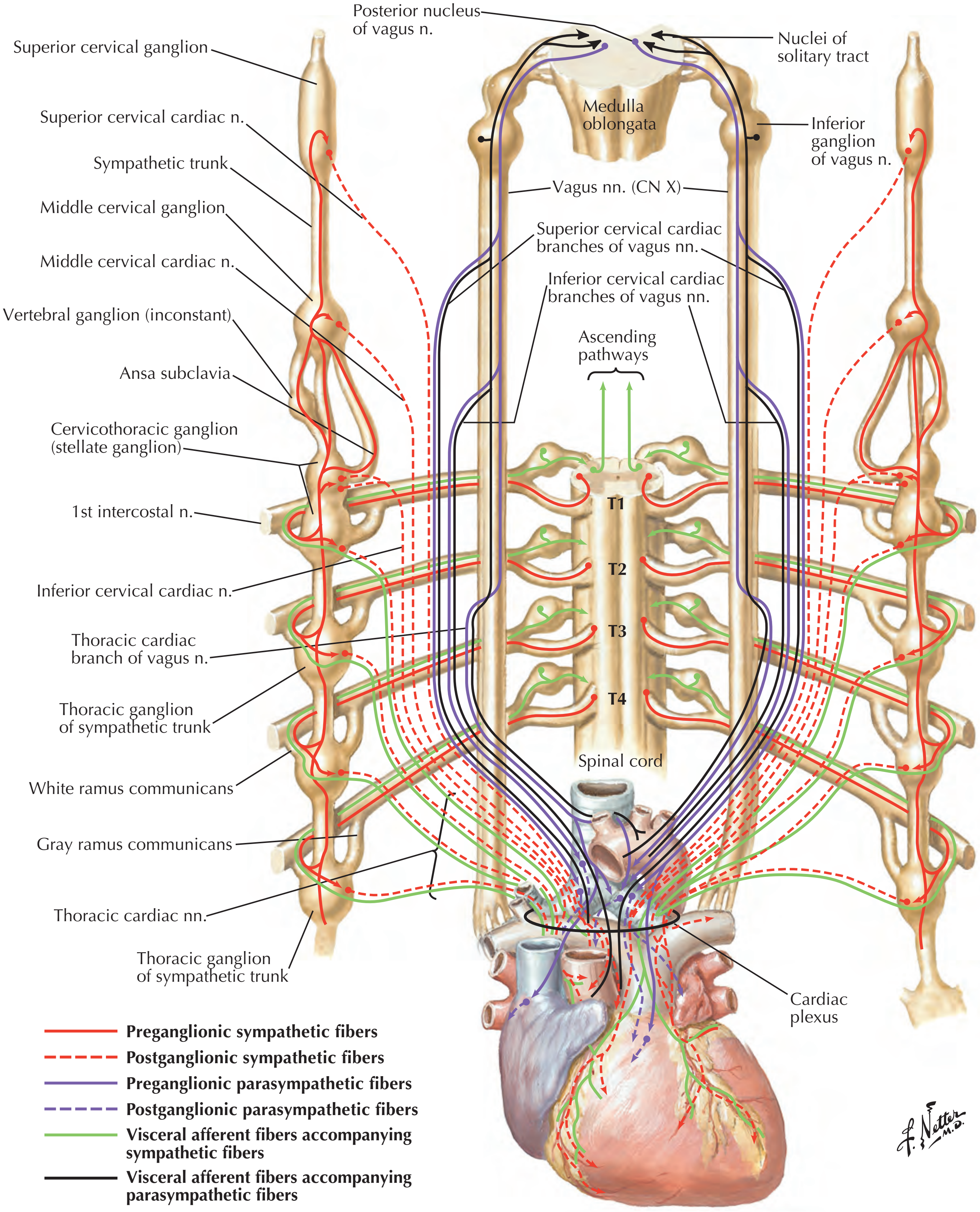
See also **Plate 229**

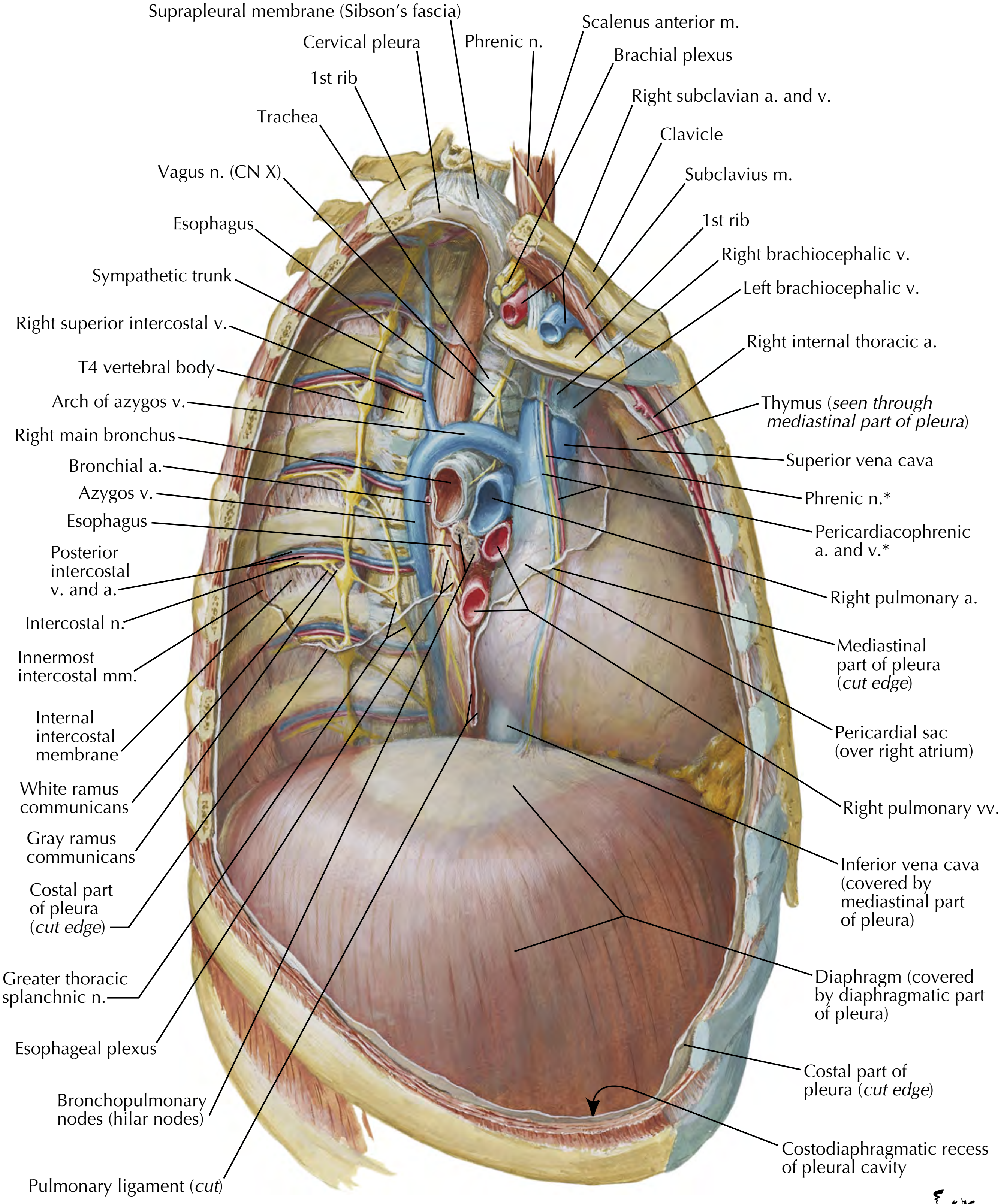


Superior cervical ganglion
Vagus n. (CN X)
Middle cervical ganglion
Middle cervical cardiac n.
Phrenic n.
Inferior cervical cardiac branch of vagus n.
Vertebral ganglion
Inferior thyroid a.
Vertebral a.
Cervicothoracic ganglion
Ansa subclavia
Right recurrent laryngeal n.
Sympathetic trunk
Inferior cervical cardiac nn.
Thoracic cardiac branch of vagus n.
Thoracic ganglion of sympathetic trunk
Thoracic cardiac nn.
Cardiac plexus
Phrenic n. (*cut*)
Superior cervical ganglion
Vagus n. (CN X)
Superior cervical cardiac n. (sympathetic)
Superior cervical cardiac branch of vagus n.
Middle cervical ganglion
Phrenic n.
Middle cervical cardiac n. (sympathetic)
Inferior cervical cardiac branch of vagus n.
Vertebral ganglion
Cervicothoracic ganglion (stellate ganglion)
Inferior cervical cardiac nn. (sympathetic)
Sympathetic trunk
Thoracic ganglion of sympathetic trunk
Thoracic cardiac nn. (sympathetic)
Thoracic cardiac branches of vagus n.
Left recurrent laryngeal n.
F. Netter M.D.

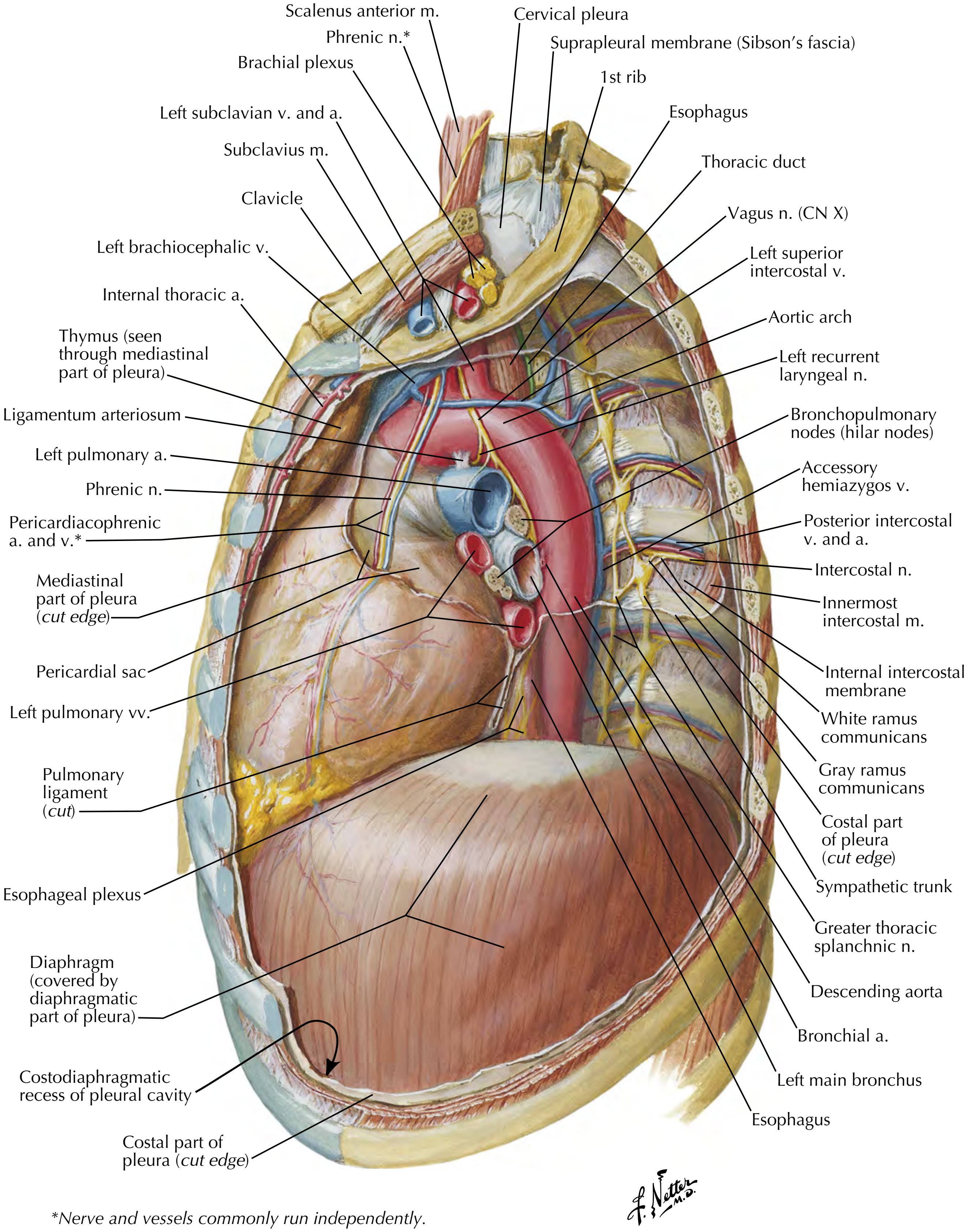
Innervation of Heart: Schema

See also **Plate 230**


Posterior nucleus of vagus n.
Nuclei of solitary tract
Superior cervical ganglion
Superior cervical cardiac n.
Sympathetic trunk
Middle cervical ganglion
Middle cervical cardiac n.
Vertebral ganglion (inconstant)
Ansa subclavia
Cervicothoracic ganglion (stellate ganglion)
1st intercostal n.
Inferior cervical cardiac n.
Thoracic cardiac branch of vagus n.
Thoracic ganglion of sympathetic trunk
White ramus communicans
Gray ramus communicans
Thoracic cardiac nn.
Thoracic ganglion of sympathetic trunk
Medulla oblongata
Inferior ganglion of vagus n.
Vagus nn. (CN X)
Superior cervical cardiac branches of vagus nn.
Inferior cervical cardiac branches of vagus nn.
Ascending pathways
T1
T2
T3
T4
Spinal cord
Cardiac plexus
Preganglionic sympathetic fibers
Postganglionic sympathetic fibers
Preganglionic parasympathetic fibers
Postganglionic parasympathetic fibers
Visceral afferent fibers accompanying sympathetic fibers
Visceral afferent fibers accompanying parasympathetic fibers


Suprapleural membrane (Sibson's fascia)
Cervical pleura
Phrenic n.
Scalenus anterior m.
Brachial plexus
1st rib
Right subclavian a. and v.
Trachea
Clavicle
Vagus n. (CN X)
Subclavius m.
Esophagus
1st rib
Right brachiocephalic v.
Sympathetic trunk
Left brachiocephalic v.
Right superior intercostal v.
Right internal thoracic a.
T4 vertebral body
Arch of azygos v.
Thymus (*seen through mediastinal part of pleura*)
Right main bronchus
Superior vena cava
Bronchial a.
Azygos v.
Phrenic n.*
Esophagus
Pericardiacophrenic a. and v.*
Posterior intercostal v. and a.
Right pulmonary a.
Intercostal n.
Mediastinal part of pleura (*cut edge*)
Innermost intercostal mm.
Internal intercostal membrane
Pericardial sac (over right atrium)
White ramus communicans
Right pulmonary vv.
Gray ramus communicans
Inferior vena cava (covered by mediastinal part of pleura)
Costal part of pleura (*cut edge*)
Greater thoracic splanchnic n.
Diaphragm (covered by diaphragmatic part of pleura)
Esophageal plexus
Costal part of pleura (*cut edge*)
Bronchopulmonary nodes (hilar nodes)
Costodiaphragmatic recess of pleural cavity
Pulmonary ligament (*cut*)

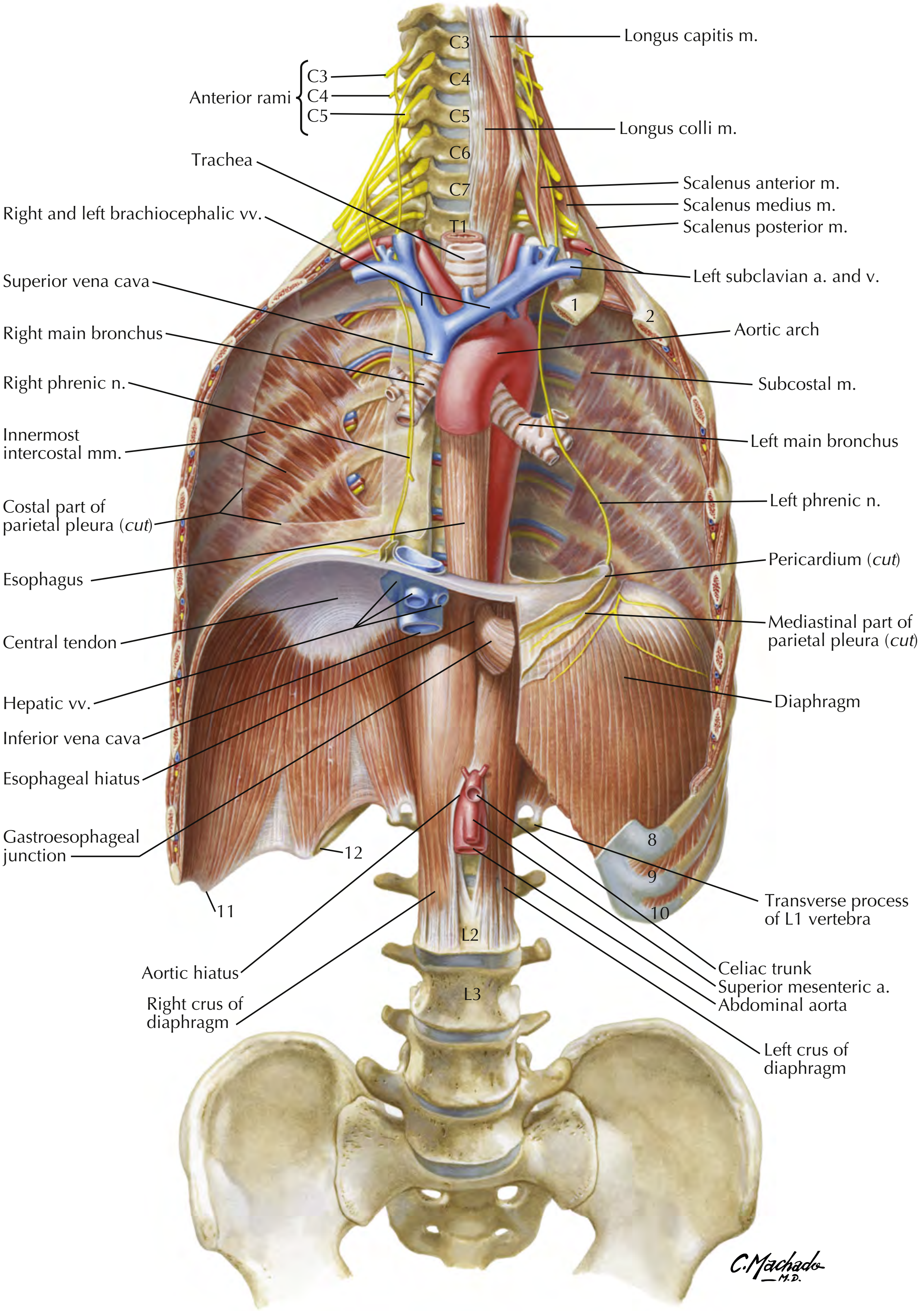
*Nerve and vessels commonly run independently.

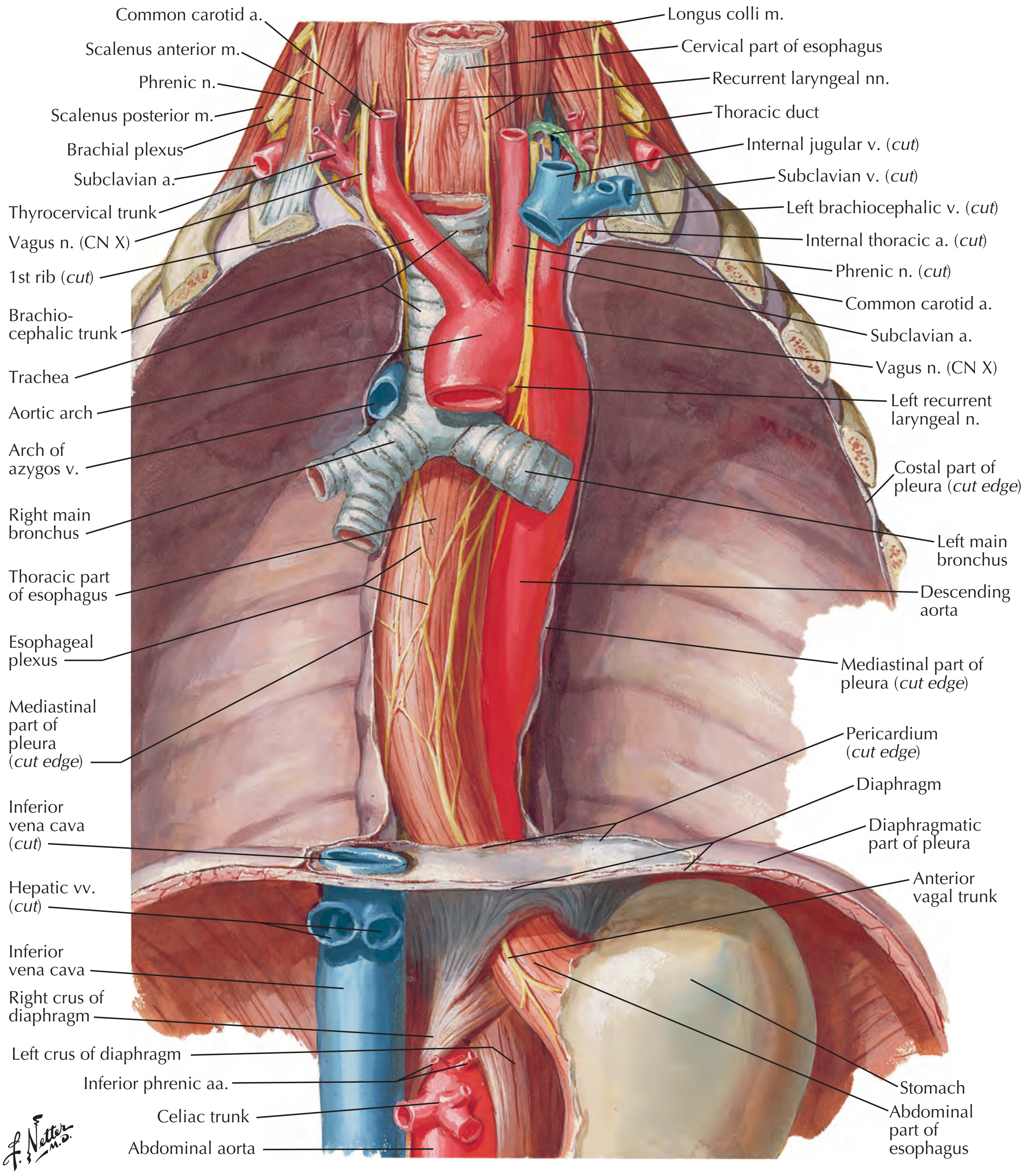

Scalenus anterior m.
Phrenic n.*
Brachial plexus
Left subclavian v. and a.
Subclavius m.
Clavicle
Left brachiocephalic v.
Internal thoracic a.
Thymus (seen through mediastinal part of pleura)
Ligamentum arteriosum
Left pulmonary a.
Phrenic n.
Pericardiacophrenic a. and v.*
Mediastinal part of pleura (*cut edge*)
Pericardial sac
Left pulmonary vv.
Pulmonary ligament (*cut*)
Esophageal plexus
Diaphragm (covered by diaphragmatic part of pleura)
Costodiaphragmatic recess of pleural cavity
Costal part of pleura (*cut edge*)
Cervical pleura
Suprapleural membrane (Sibson's fascia)
1st rib
Esophagus
Thoracic duct
Vagus n. (CN X)
Left superior intercostal v.
Aortic arch
Left recurrent laryngeal n.
Bronchopulmonary nodes (hilar nodes)
Accessory hemiazygos v.
Posterior intercostal v. and a.
Intercostal n.
Innermost intercostal m.
Internal intercostal membrane
White ramus communicans
Gray ramus communicans
Costal part of pleura (*cut edge*)
Sympathetic trunk
Greater thoracic splanchnic n.
Descending aorta
Bronchial a.
Left main bronchus
Esophagus
F. Netter M.D.

**Nerve and vessels commonly run independently.*

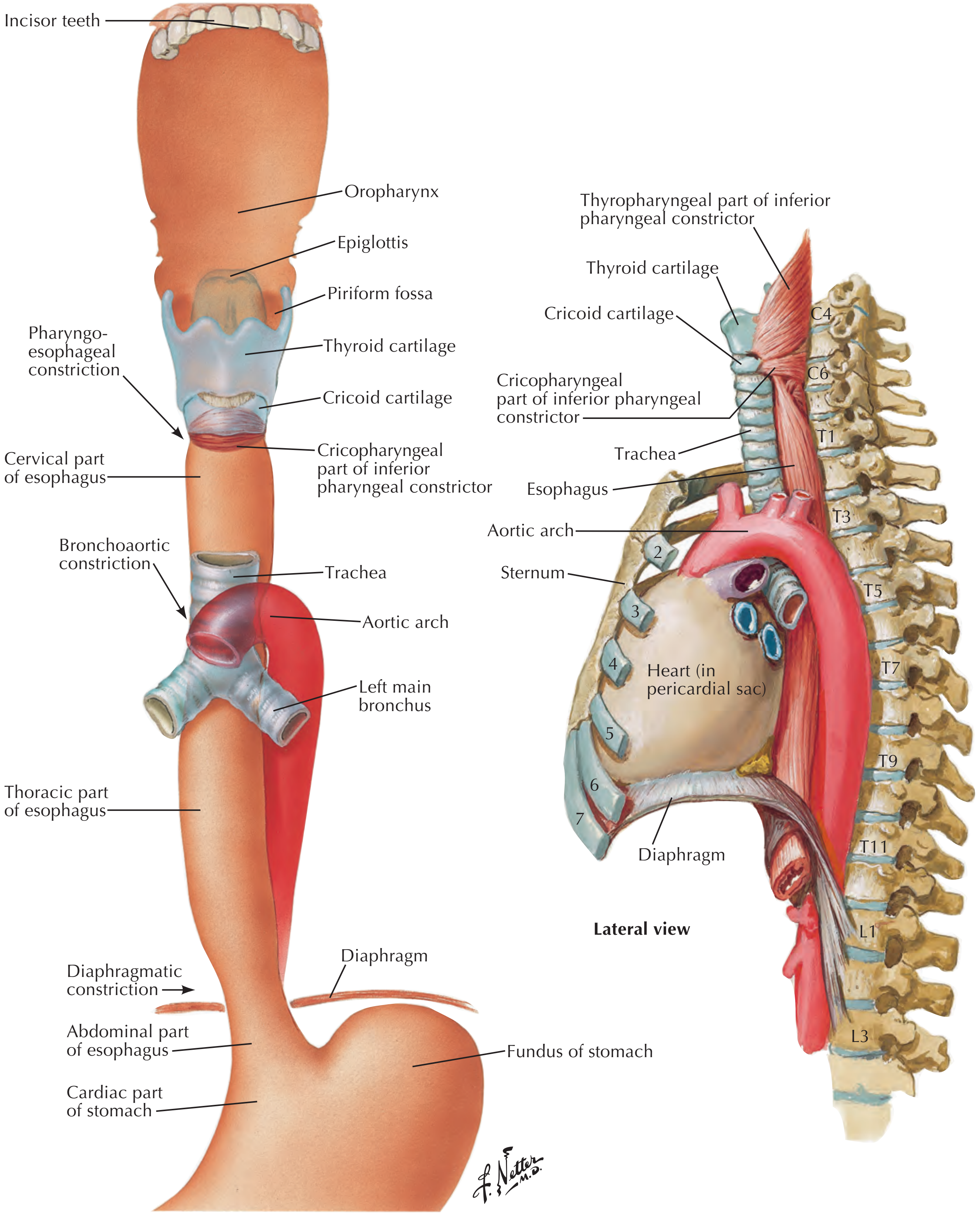
Phrenic Nerve

See also **Plates 56, 57, 251, 252**

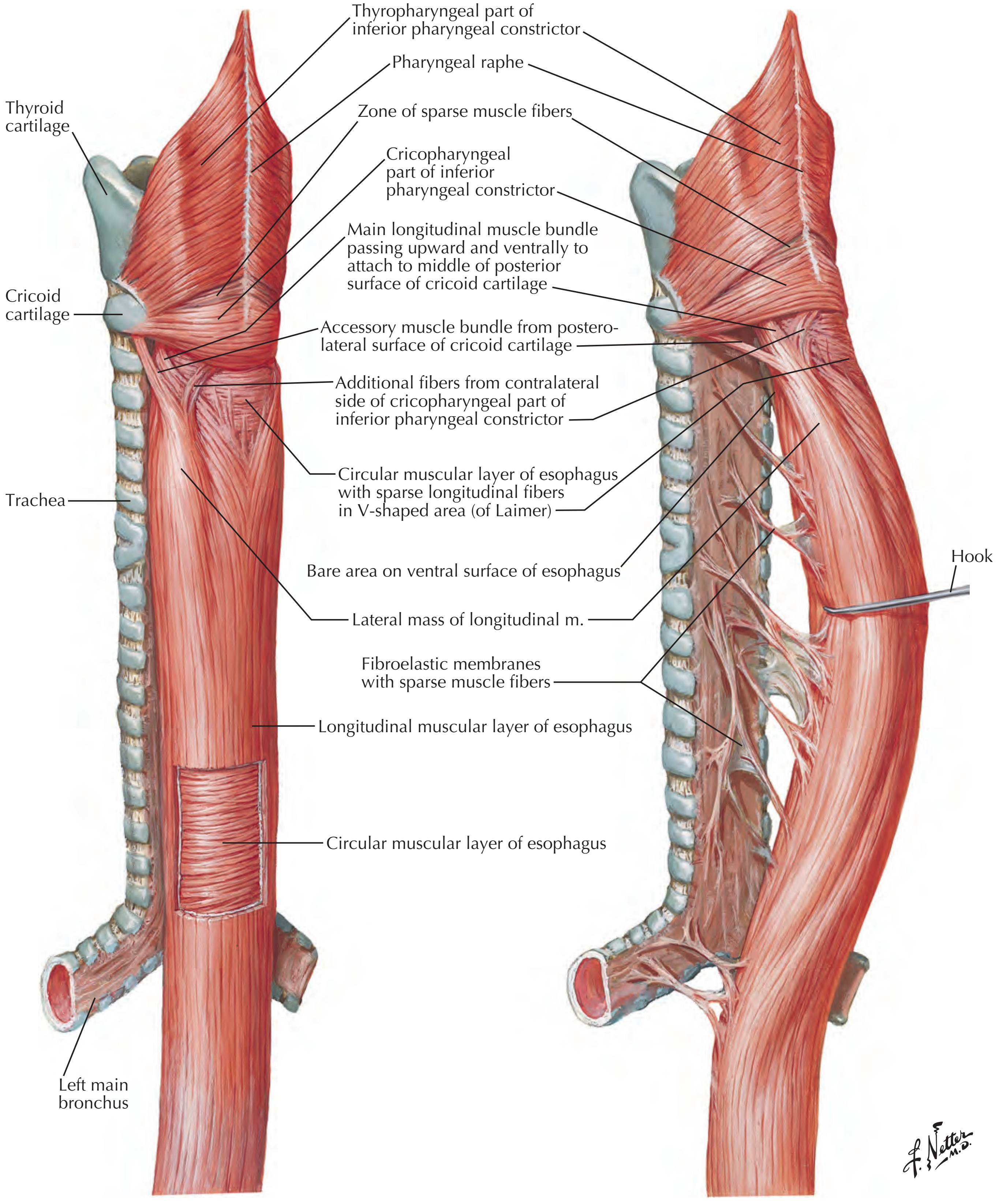

Longus capitis m.
C3
C4
C5
C6
C7
T1
Anterior rami
C3
C4
C5
Longus colli m.
Trachea
Scalenus anterior m.
Scalenus medius m.
Scalenus posterior m.
Right and left brachiocephalic vv.
Left subclavian a. and v.
Superior vena cava
1
1
2
Aortic arch
Right main bronchus
Subcostal m.
Right phrenic n.
Innermost intercostal mm.
Left main bronchus
Costal part of parietal pleura (*cut*)
Left phrenic n.
Esophagus
Pericardium (*cut*)
Central tendon
Mediastinal part of parietal pleura (*cut*)
Hepatic vv.
Diaphragm
Inferior vena cava
Esophageal hiatus
Gastroesophageal junction
12
8
9
10
11
Transverse process of L1 vertebra
L2
Aortic hiatus
Celiac trunk
Superior mesenteric a.
Abdominal aorta
Right crus of diaphragm
L3
Left crus of diaphragm


Common carotid a.
Scalenus anterior m.
Phrenic n.
Scalenus posterior m.
Brachial plexus
Subclavian a.
Thyrocervical trunk
Vagus n. (CN X)
1st rib (*cut*)
Brachio-cephalic trunk
Trachea
Aortic arch
Arch of azygos v.
Right main bronchus
Thoracic part of esophagus
Esophageal plexus
Mediastinal part of pleura (*cut edge*)
Inferior vena cava (*cut*)
Hepatic vv. (*cut*)
Inferior vena cava
Right crus of diaphragm
Left crus of diaphragm
Inferior phrenic aa.
Celiac trunk
Abdominal aorta
Longus colli m.
Cervical part of esophagus
Recurrent laryngeal nn.
Thoracic duct
Internal jugular v. (*cut*)
Subclavian v. (*cut*)
Left brachiocephalic v. (*cut*)
Internal thoracic a. (*cut*)
Phrenic n. (*cut*)
Common carotid a.
Subclavian a.
Vagus n. (CN X)
Left recurrent laryngeal n.
Costal part of pleura (*cut edge*)
Left main bronchus
Descending aorta
Mediastinal part of pleura (*cut edge*)
Pericardium (*cut edge*)
Diaphragm
Diaphragmatic part of pleura
Anterior vagal trunk
Stomach
Abdominal part of esophagus
F. Netter M.D.

Esophagus: Constrictions and Relations


Incisor teeth
Oropharynx
Epiglottis
Piriform fossa
Pharyngo-esophageal constriction
Thyroid cartilage
Cricoid cartilage
Cervical part of esophagus
Cricopharyngeal part of inferior pharyngeal constrictor
Bronchoaortic constriction
Trachea
Aortic arch
Left main bronchus
Thoracic part of esophagus
Diaphragmatic constriction
Diaphragm
Abdominal part of esophagus
Fundus of stomach
Cardiac part of stomach
Thyropharyngeal part of inferior pharyngeal constrictor
Thyroid cartilage
Cricoid cartilage
Cricopharyngeal part of inferior pharyngeal constrictor
Trachea
Esophagus
Aortic arch
Sternum
Heart (in pericardial sac)
Diaphragm
C4
C6
T1
T3
T5
T7
T9
T11
L1
L3
2
3
4
5
6
7

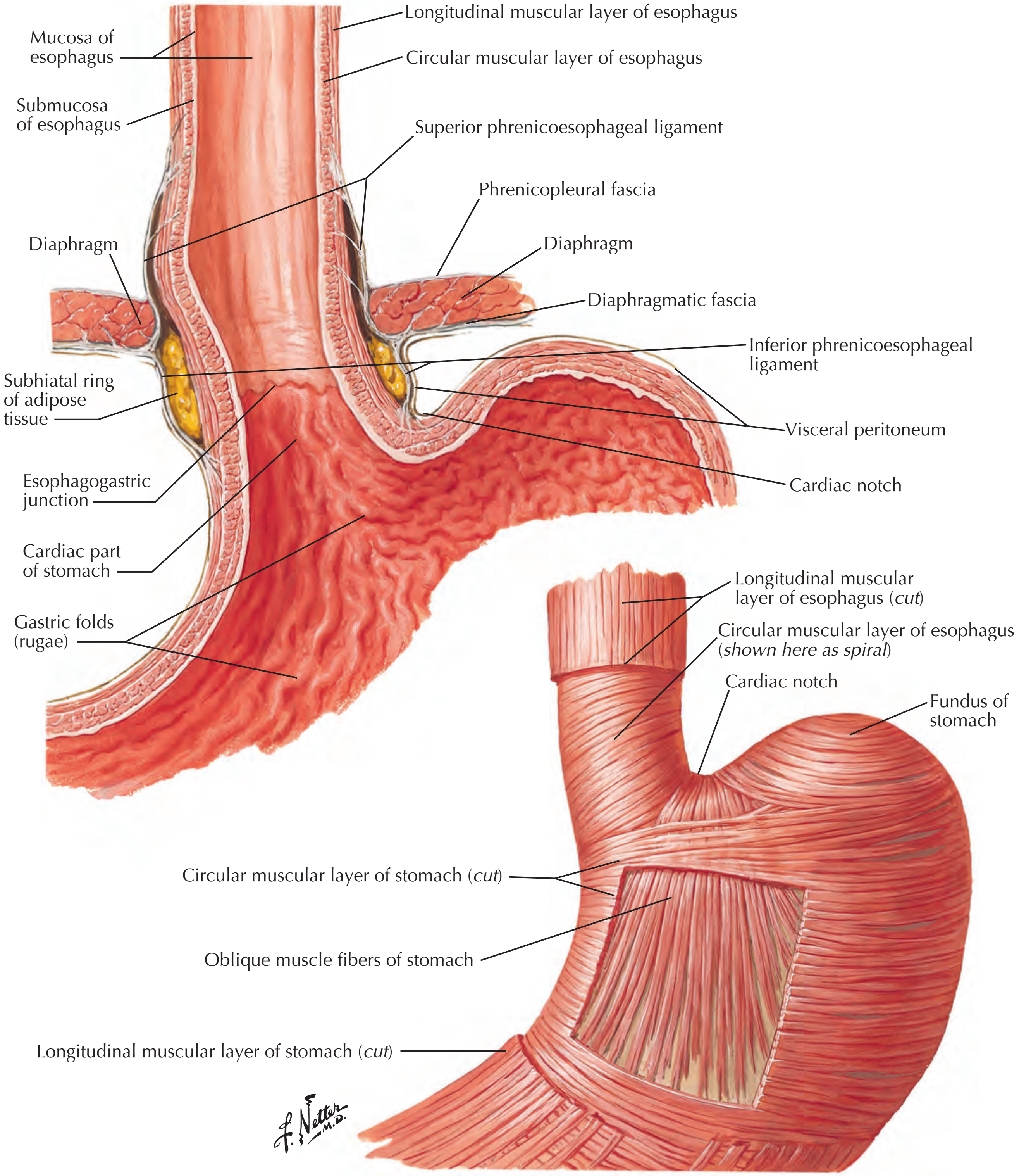
Lateral view


Thyropharyngeal part of inferior pharyngeal constrictor
Pharyngeal raphe
Zone of sparse muscle fibers
Cricopharyngeal part of inferior pharyngeal constrictor
Main longitudinal muscle bundle passing upward and ventrally to attach to middle of posterior surface of cricoid cartilage
Accessory muscle bundle from posterolateral surface of cricoid cartilage
Additional fibers from contralateral side of cricopharyngeal part of inferior pharyngeal constrictor
Circular muscular layer of esophagus with sparse longitudinal fibers in V-shaped area (of Laimer)
Bare area on ventral surface of esophagus
Lateral mass of longitudinal m.
Fibroelastic membranes with sparse muscle fibers
Longitudinal muscular layer of esophagus
Circular muscular layer of esophagus
Thyroid cartilage
Cricoid cartilage
Trachea
Left main bronchus
Hook
F. Netter M.D.

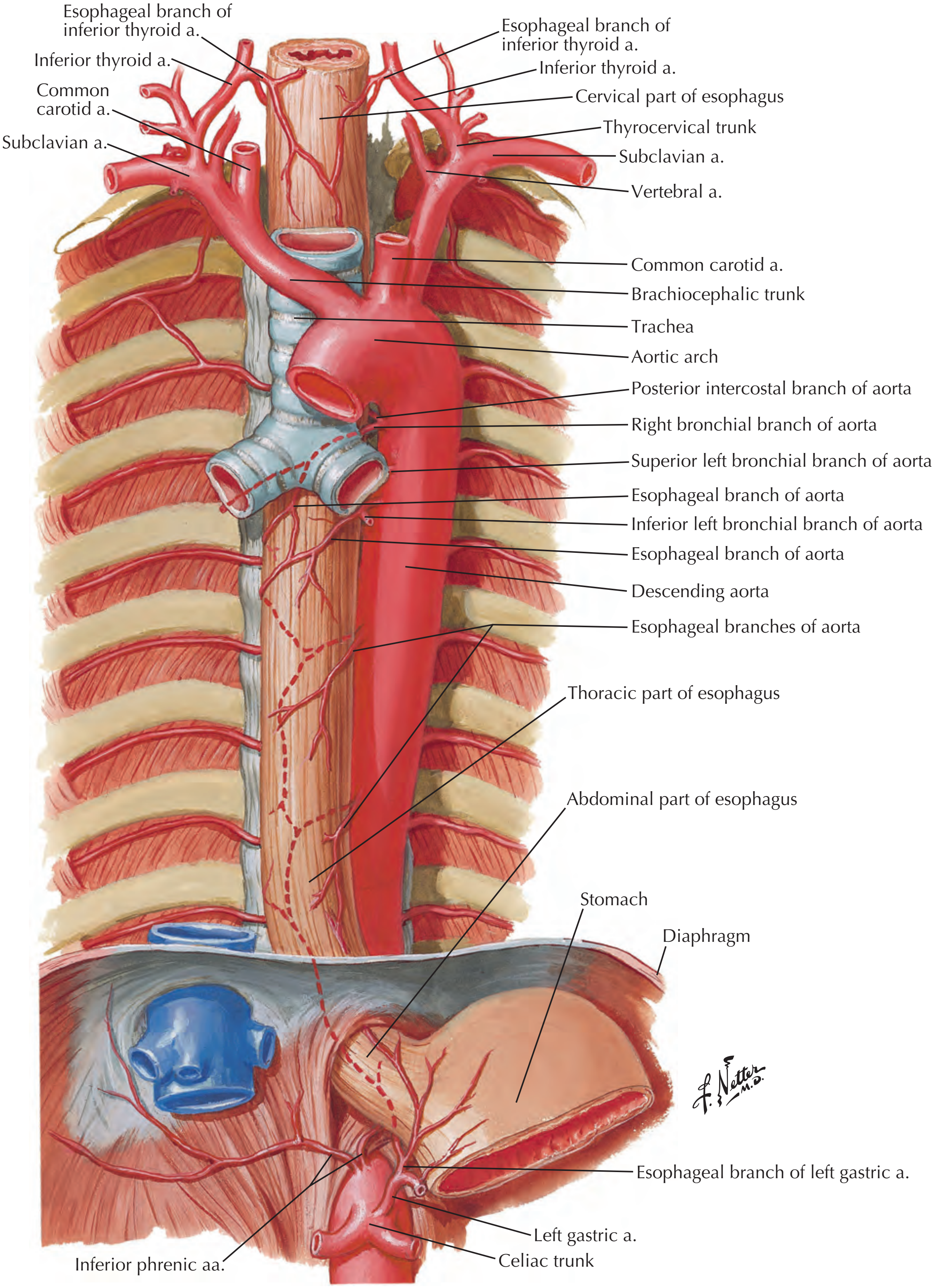
Posterolateral view

Esophagogastric Junction

See also **Plate 295**

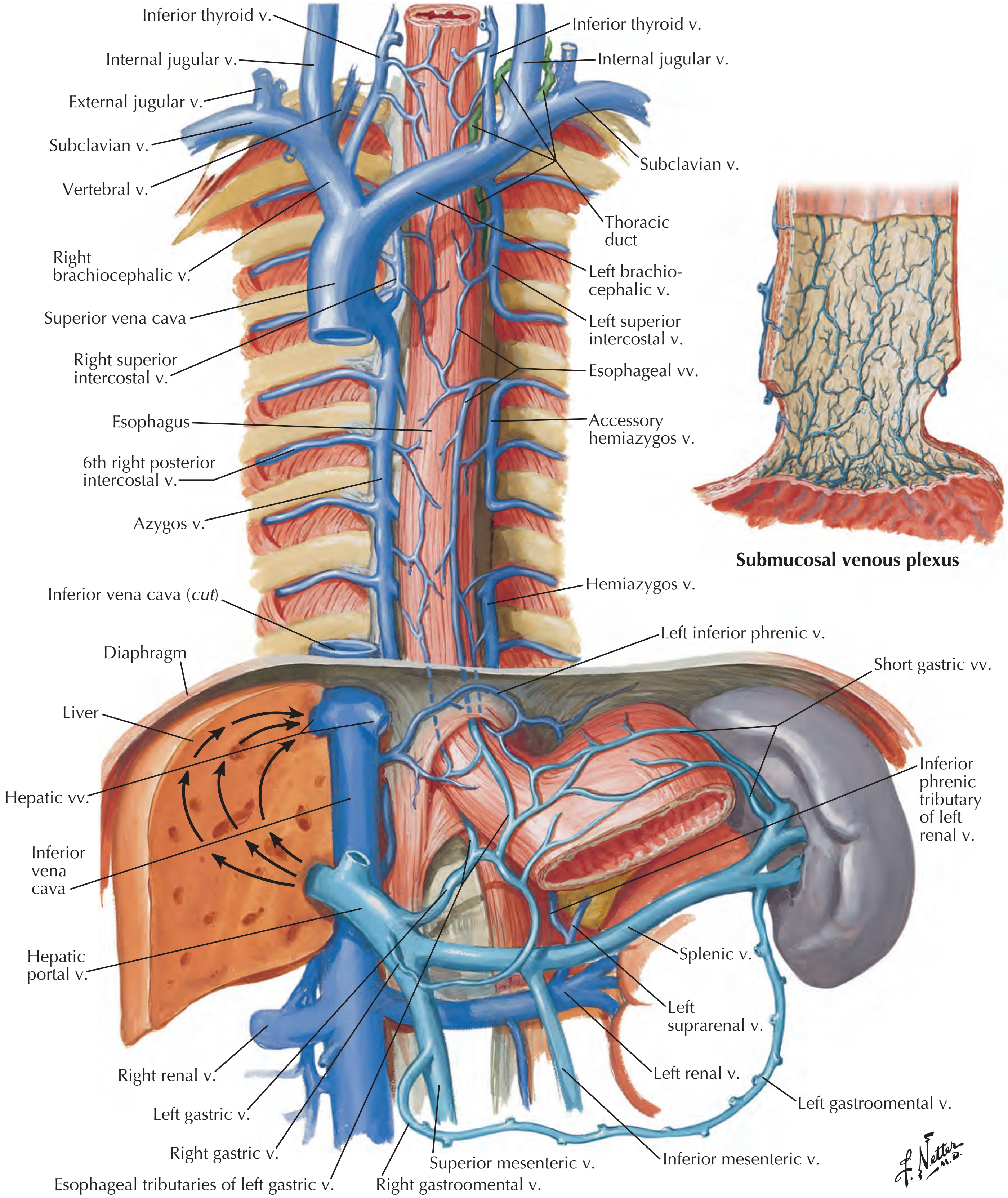

Mucosa of esophagus
Submucosa of esophagus
Diaphragm
Subhiatal ring of adipose tissue
Esophagogastric junction
Cardiac part of stomach
Gastric folds (rugae)
Longitudinal muscular layer of esophagus
Circular muscular layer of esophagus
Superior phrenicoesophageal ligament
Phrenicopleural fascia
Diaphragm
Diaphragmatic fascia
Inferior phrenicoesophageal ligament
Visceral peritoneum
Cardiac notch
Longitudinal muscular layer of esophagus (*cut*)
Circular muscular layer of esophagus (*shown here as spiral*)
Cardiac notch
Fundus of stomach
Circular muscular layer of stomach (*cut*)
Oblique muscle fibers of stomach
Longitudinal muscular layer of stomach (*cut*)
F. Netter M.D.

See also **Plates 222, 310, BP 49**


Esophageal branch of inferior thyroid a.
Inferior thyroid a.
Common carotid a.
Subclavian a.
Esophageal branch of inferior thyroid a.
Inferior thyroid a.
Cervical part of esophagus
Thyrocervical trunk
Subclavian a.
Vertebral a.
Common carotid a.
Brachiocephalic trunk
Trachea
Aortic arch
Posterior intercostal branch of aorta
Right bronchial branch of aorta
Superior left bronchial branch of aorta
Esophageal branch of aorta
Inferior left bronchial branch of aorta
Esophageal branch of aorta
Descending aorta
Esophageal branches of aorta
Thoracic part of esophagus
Abdominal part of esophagus
Stomach
Diaphragm
F. Netter M.D.
Esophageal branch of left gastric a.
Left gastric a.
Celiac trunk
Inferior phrenic aa.

Veins of Esophagus

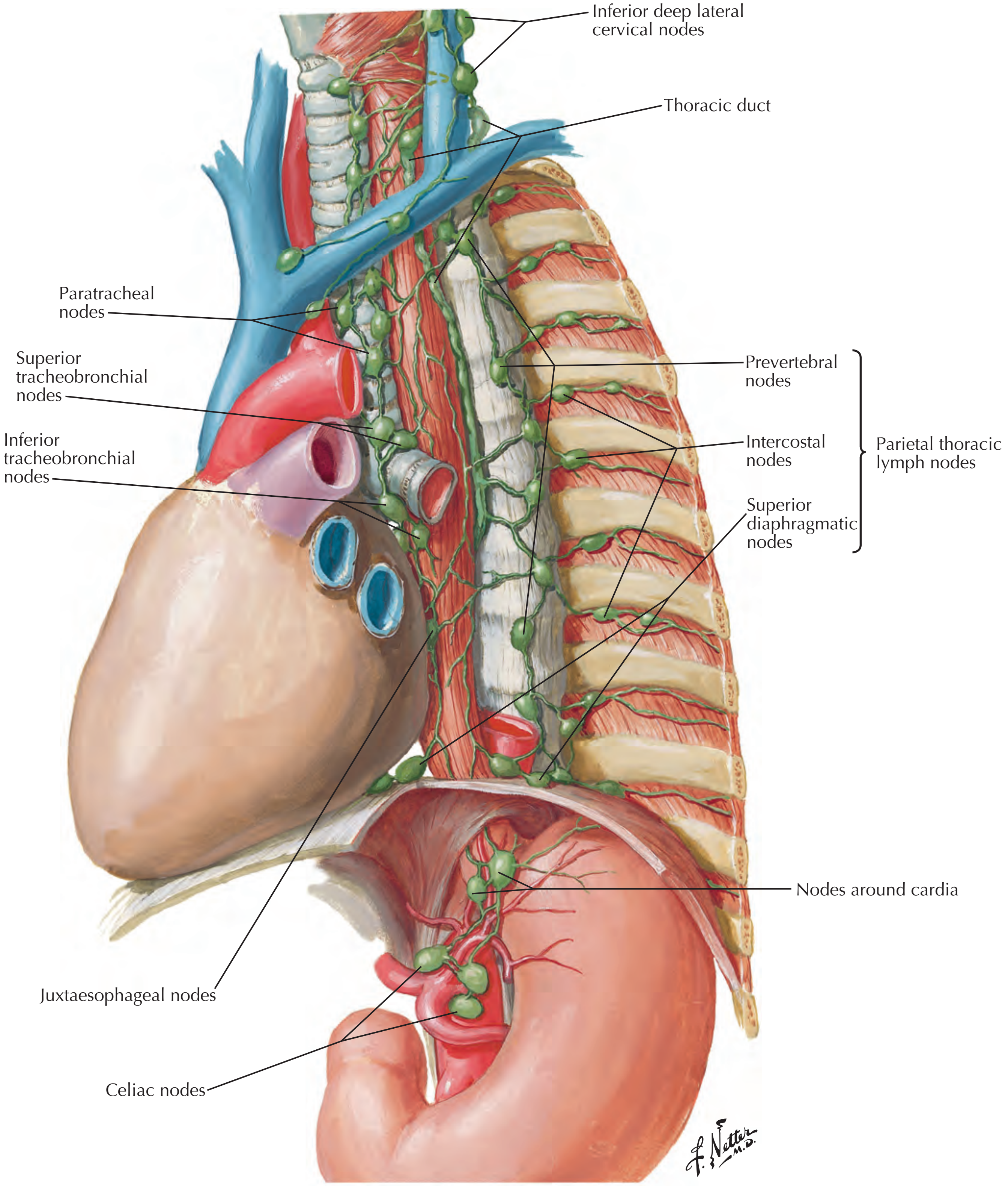
See also **Plate 213**


Inferior thyroid v.
Internal jugular v.
External jugular v.
Subclavian v.
Vertebral v.
Right brachiocephalic v.
Superior vena cava
Right superior intercostal v.
Esophagus
6th right posterior intercostal v.
Azygos v.
Inferior vena cava (*cut*)
Diaphragm
Liver
Hepatic vv.
Inferior vena cava
Hepatic portal v.
Right renal v.
Left gastric v.
Right gastric v.
Esophageal tributaries of left gastric v.
Inferior thyroid v.
Internal jugular v.
Subclavian v.
Thoracic duct
Left brachiocephalic v.
Left superior intercostal v.
Esophageal vv.
Accessory hemiazygos v.
Hemiazygos v.
Left inferior phrenic v.
Short gastric vv.
Inferior phrenic tributary of left renal v.
Splenic v.
Left suprarenal v.
Left renal v.
Left gastroomental v.
Inferior mesenteric v.
Superior mesenteric v.
Right gastroomental v.

Submucosal venous plexus

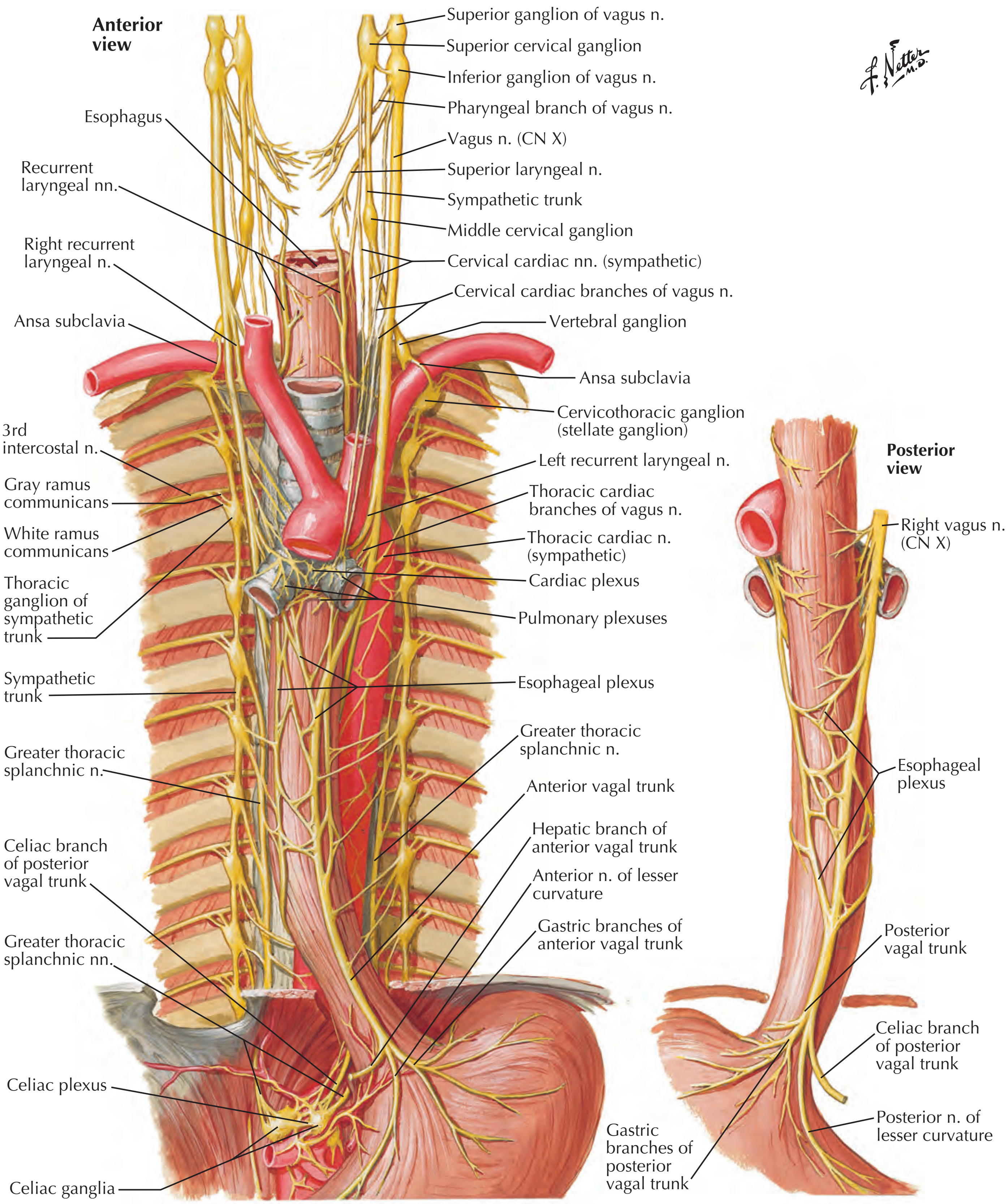
Lymph Vessels and Lymph Nodes of Esophagus

See also Plate 228

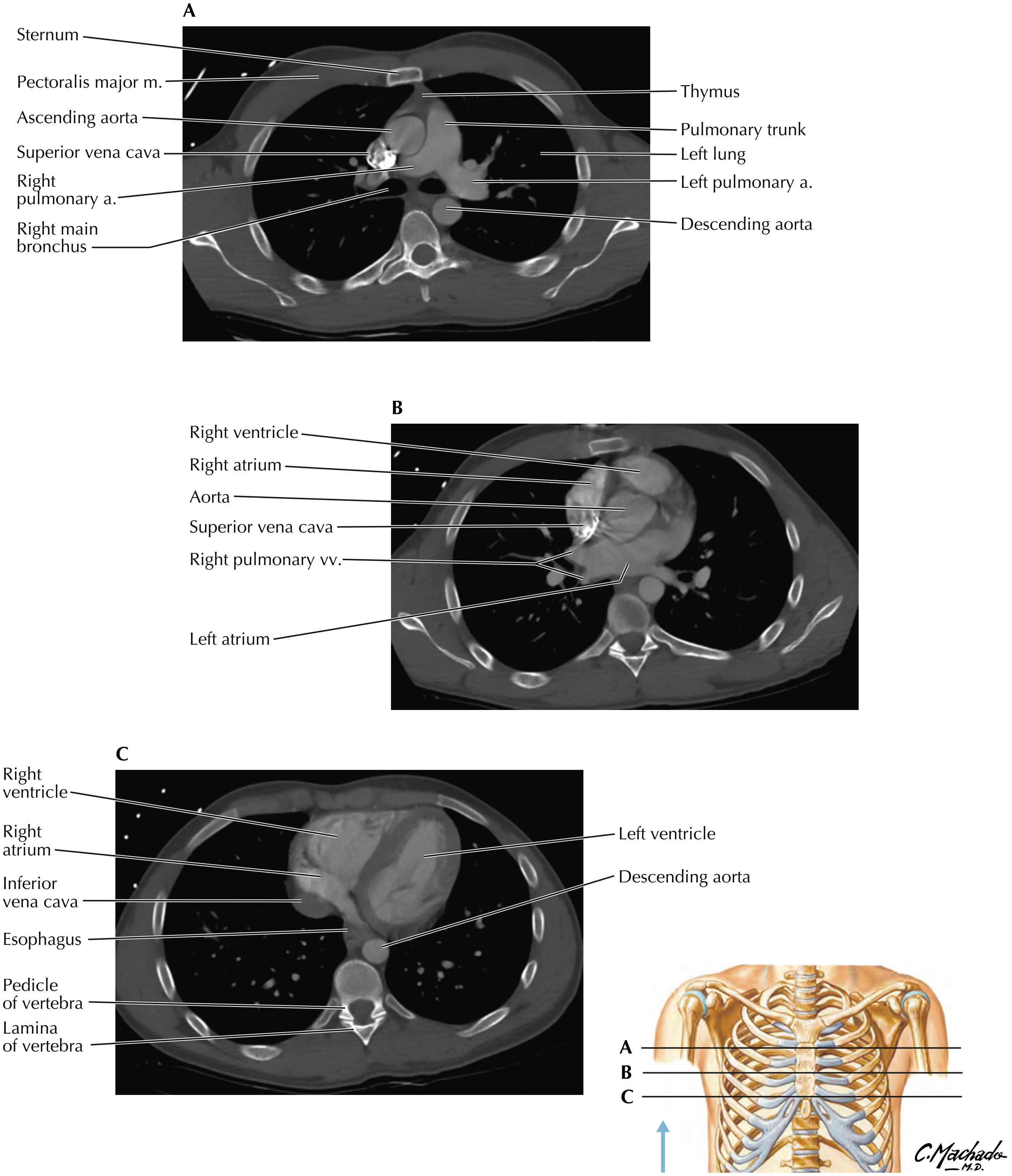

Inferior deep lateral cervical nodes
Thoracic duct
Paratracheal nodes
Superior tracheobronchial nodes
Inferior tracheobronchial nodes
Prevertebral nodes
Intercostal nodes
Superior diaphragmatic nodes
Parietal thoracic lymph nodes
Nodes around cardia
Juxtaesophageal nodes
Celiac nodes
F. Netter M.D.

Nerves of Esophagus

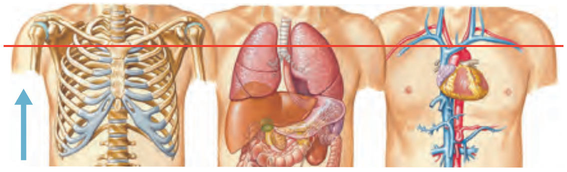
See also **Plates 320, 321, BP 48**

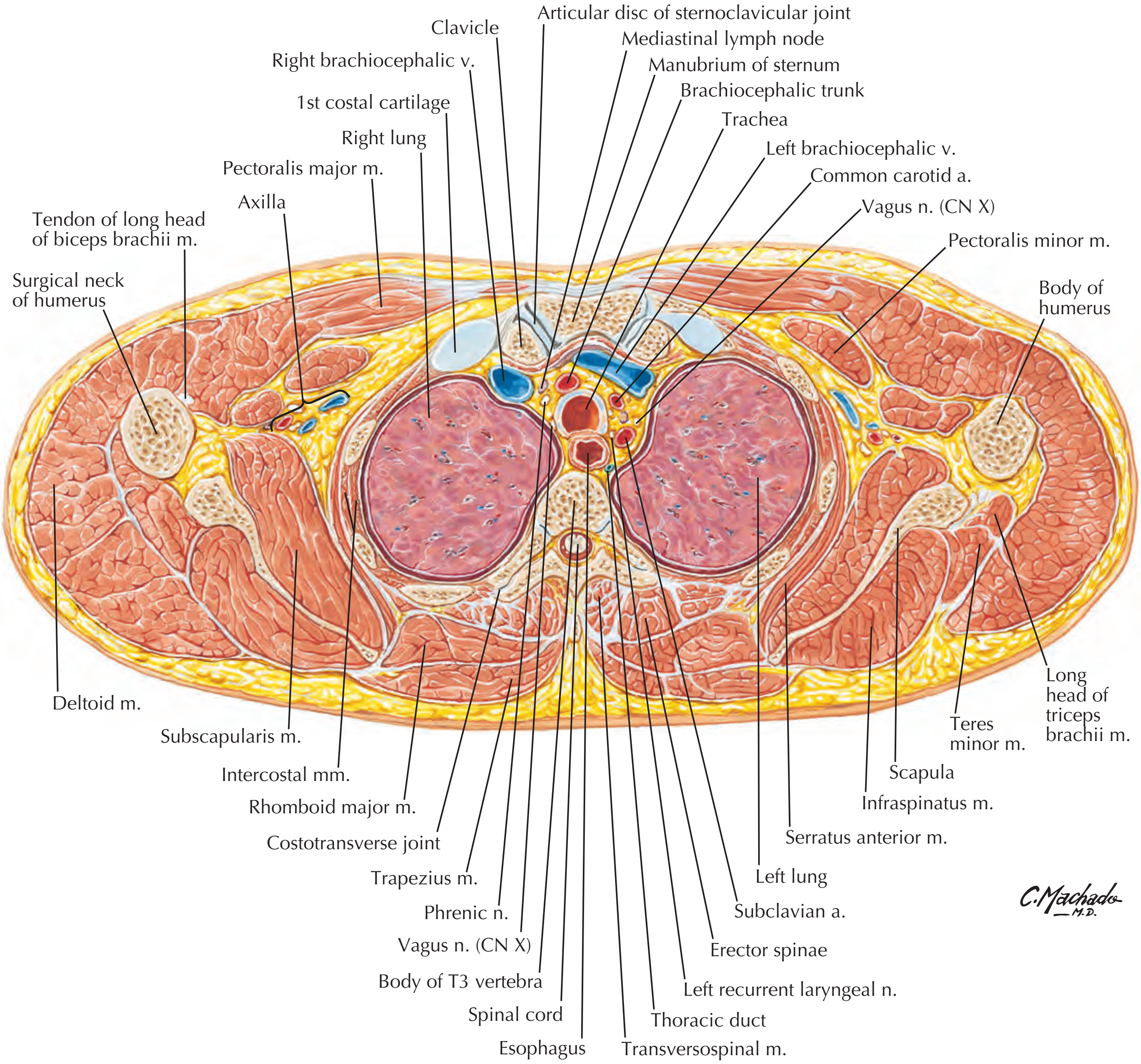

Anterior view
Superior ganglion of vagus n.
Superior cervical ganglion
Inferior ganglion of vagus n.
Pharyngeal branch of vagus n.
Vagus n. (CN X)
Superior laryngeal n.
Sympathetic trunk
Middle cervical ganglion
Cervical cardiac nn. (sympathetic)
Cervical cardiac branches of vagus n.
Vertebral ganglion
Ansa subclavia
Cervicothoracic ganglion (stellate ganglion)
Left recurrent laryngeal n.
Thoracic cardiac branches of vagus n.
Thoracic cardiac n. (sympathetic)
Cardiac plexus
Pulmonary plexuses
Esophageal plexus
Greater thoracic splanchnic n.
Anterior vagal trunk
Hepatic branch of anterior vagal trunk
Anterior n. of lesser curvature
Gastric branches of anterior vagal trunk
Esophagus
Recurrent laryngeal nn.
Right recurrent laryngeal n.
Ansa subclavia
3rd intercostal n.
Gray ramus communicans
White ramus communicans
Thoracic ganglion of sympathetic trunk
Sympathetic trunk
Greater thoracic splanchnic n.
Celiac branch of posterior vagal trunk
Greater thoracic splanchnic nn.
Celiac plexus
Celiac ganglia
Gastric branches of posterior vagal trunk
Posterior view
Right vagus n. (CN X)
Esophageal plexus
Posterior vagal trunk
Celiac branch of posterior vagal trunk
Posterior n. of lesser curvature

Axial CT images of the thorax from superior (A) to inferior (C)

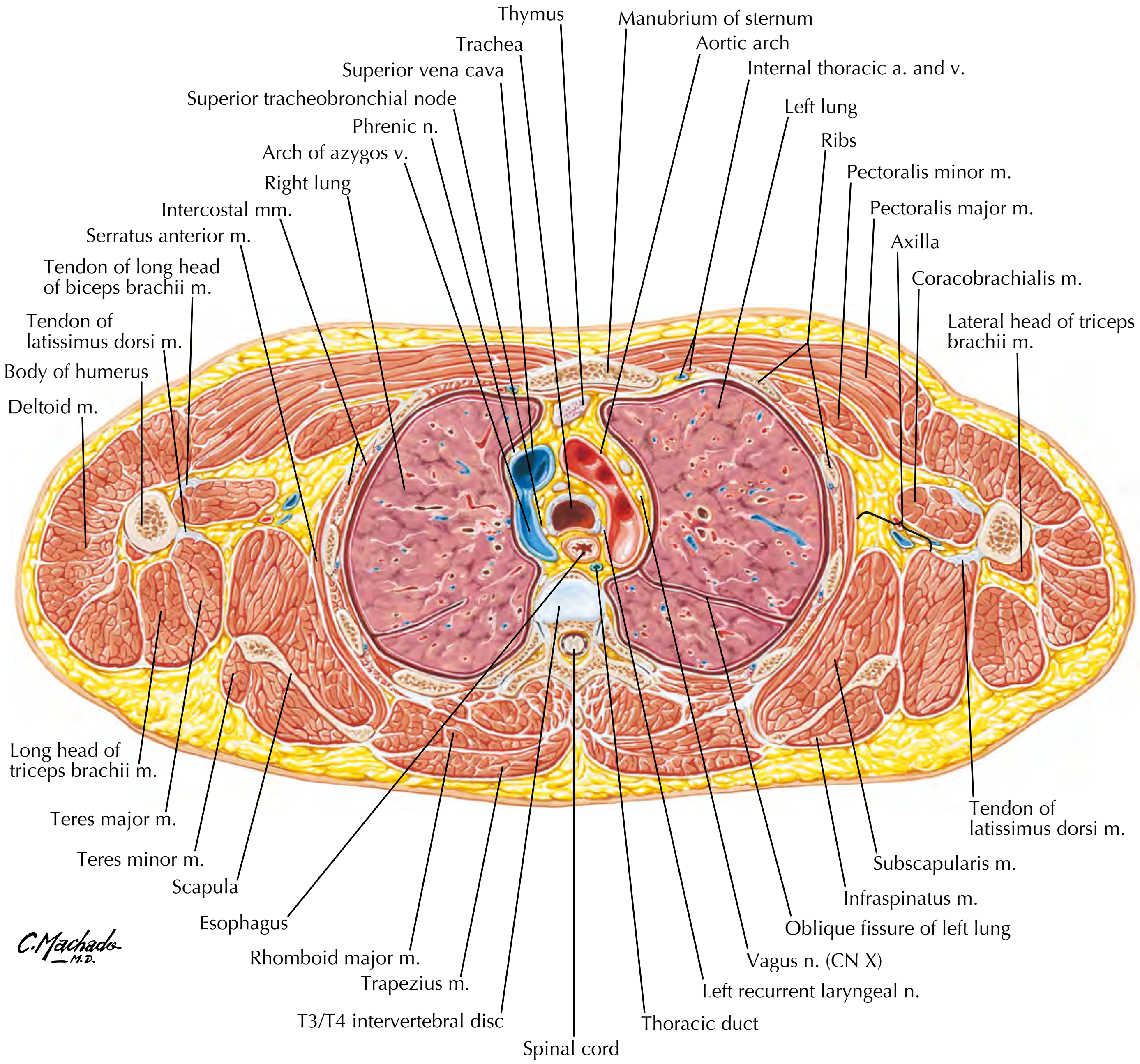

A
Sternum
Pectoralis major m.
Ascending aorta
Superior vena cava
Right pulmonary a.
Right main bronchus
Thymus
Pulmonary trunk
Left lung
Left pulmonary a.
Descending aorta
B
Right ventricle
Right atrium
Aorta
Superior vena cava
Right pulmonary vv.
Left atrium
C
Right ventricle
Right atrium
Inferior vena cava
Esophagus
Pedicle of vertebra
Lamina of vertebra
Left ventricle
Descending aorta
A
B
C
C.Machado M.D.

Cross Section of Thorax at T3 Vertebral Level

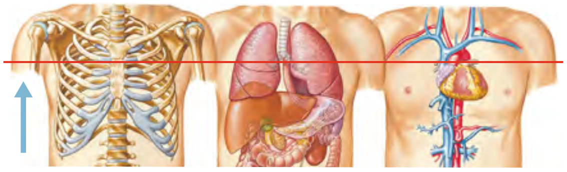


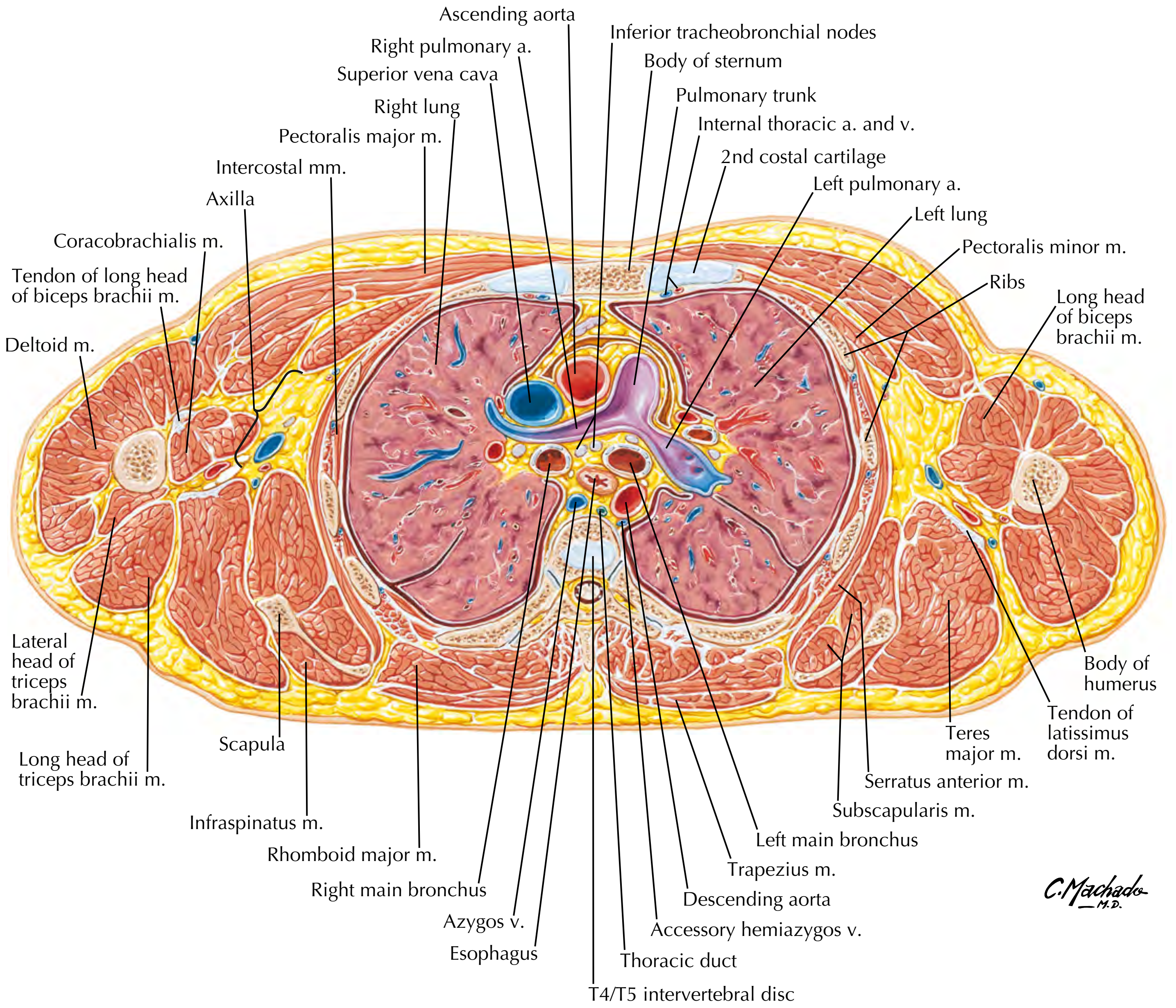

Clavicle
Articular disc of sternoclavicular joint
Mediastinal lymph node
Right brachiocephalic v.
Manubrium of sternum
Brachiocephalic trunk
1st costal cartilage
Trachea
Right lung
Left brachiocephalic v.
Pectoralis major m.
Common carotid a.
Axilla
Vagus n. (CN X)
Tendon of long head of biceps brachii m.
Pectoralis minor m.
Surgical neck of humerus
Body of humerus
Deltoid m.
Subscapularis m.
Intercostal mm.
Rhomboid major m.
Costotransverse joint
Trapezius m.
Phrenic n.
Vagus n. (CN X)
Body of T3 vertebra
Spinal cord
Esophagus
Long head of triceps brachii m.
Teres minor m.
Scapula
Infraspinatus m.
Serratus anterior m.
Left lung
Subclavian a.
Erector spinae
Left recurrent laryngeal n.
Thoracic duct
Transversospinal m.
C.Machado M.D.

Cross Section of Thorax at T3/T4 Disc Level


Thymus
Manubrium of sternum
Trachea
Aortic arch
Superior vena cava
Internal thoracic a. and v.
Superior tracheobronchial node
Left lung
Phrenic n.
Ribs
Arch of azygos v.
Pectoralis minor m.
Right lung
Intercostal mm.
Pectoralis major m.
Serratus anterior m.
Axilla
Tendon of long head of biceps brachii m.
Coracobrachialis m.
Tendon of latissimus dorsi m.
Lateral head of triceps brachii m.
Body of humerus
Deltoid m.
Long head of triceps brachii m.
Tendon of latissimus dorsi m.
Teres major m.
Subscapularis m.
Teres minor m.
Scapula
Infraspinatus m.
Esophagus
Oblique fissure of left lung
C.Machado M.D.
Rhomboid major m.
Vagus n. (CN X)
Trapezius m.
Left recurrent laryngeal n.
T3/T4 intervertebral disc
Thoracic duct
Spinal cord

Cross Section of Thorax at T4/T5 Disc Level




Ascending aorta
Right pulmonary a.
Superior vena cava
Right lung
Pectoralis major m.
Intercostal mm.
Axilla
Coracobrachialis m.
Tendon of long head of biceps brachii m.
Deltoid m.
Inferior tracheobronchial nodes
Body of sternum
Pulmonary trunk
Internal thoracic a. and v.
2nd costal cartilage
Left pulmonary a.
Left lung
Pectoralis minor m.
Ribs
Long head of biceps brachii m.
Lateral head of triceps brachii m.
Long head of triceps brachii m.
Scapula
Infraspinatus m.
Rhomboid major m.
Right main bronchus
Azygos v.
Esophagus
T4/T5 intervertebral disc
Thoracic duct
Accessory hemiazygos v.
Descending aorta
Trapezius m.
Left main bronchus
Subscapularis m.
Serratus anterior m.
Teres major m.
Tendon of latissimus dorsi m.
Body of humerus
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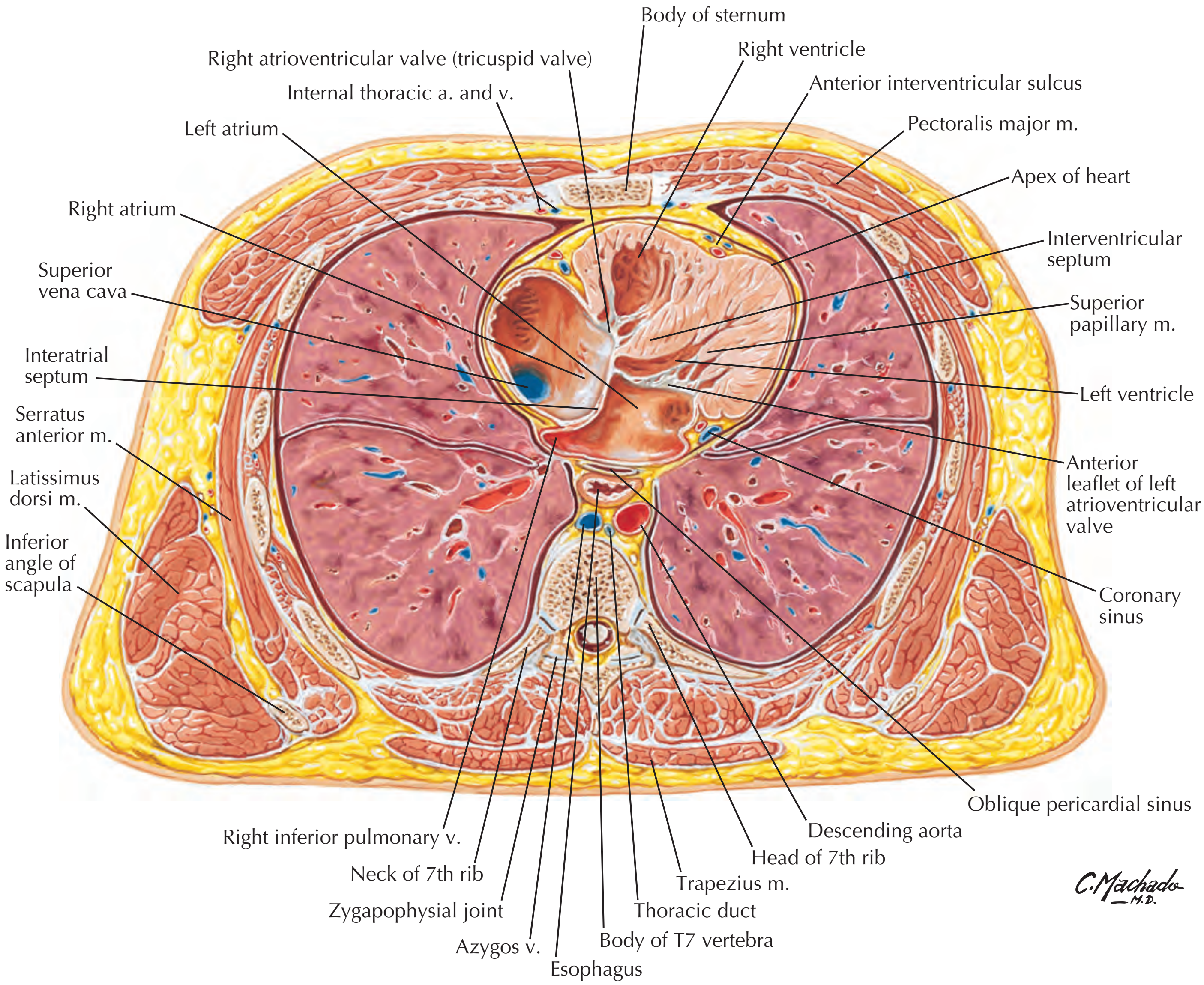

Body of sternum
Right atrioventricular valve (tricuspid valve)
Right ventricle
Anterior interventricular sulcus
Internal thoracic a. and v.
Left atrium
Pectoralis major m.
Apex of heart
Right atrium
Interventricular septum
Superior vena cava
Superior papillary m.
Interatrial septum
Left ventricle
Serratus anterior m.
Anterior leaflet of left atrioventricular valve
Latissimus dorsi m.
Inferior angle of scapula
Coronary sinus
Oblique pericardial sinus
Right inferior pulmonary v.
Descending aorta
Neck of 7th rib
Head of 7th rib
Trapezius m.
Zygapophysial joint
Thoracic duct
Body of T7 vertebra
Azygos v.
Esophagus
C.Machado M.D.

ANATOMICAL STRUCTURE	CLINICAL COMMENT	PLATE NUMBERS
Nervous System and Sense Organs		
Long thoracic nerve	May be damaged during chest tube placement or mastectomy, resulting in winged scapula (denervation of serratus anterior muscle)	206, 209
Intercostal nerve	Site of local anesthetic nerve block for procedures such as thoracostomy or to alleviate pain caused by herpes zoster (shingles)	211, 212
Spinal (posterior root) ganglion	Can house dormant varicella zoster virus, which, when activated, can result in herpes zoster (shingles)	212
Phrenic nerve	Surgical injury to phrenic nerve may cause ipsilateral paralysis of diaphragm; diaphragmatic irritation may manifest as shoulder pain because of referral to C3–C5 spinal levels	214, 216, 232
Recurrent laryngeal nerve	The left nerve takes a circuitous path around aorta and may rarely become compressed by large thoracic aortic aneurysm or enlarged left atrium, producing hoarse voice (Ortner's syndrome); more often, these branches are affected by malignancies, such as those of thyroid gland	252, 254
Thoracic cardiac nerves (sympathetic)	Pain of myocardial ischemia referred to upper thoracic dermatomes; may be perceived as somatic pain in thorax and medial upper limb	250
Skeletal System		
Ribs	Rib fractures may cause respiratory dysfunction, predispose to pneumonia, and injure underlying structures (e.g., liver and spleen); severe fractures may breach pleural space and cause pneumothorax; flail chest occurs when multiple fractures in adjacent ribs create "floating" area of thorax with paradoxical motion during inspiration	203
Costochondral and sternochondral (sternocostal) joints	Frequent sites of pain and tenderness after thoracic wall injury or excessive weightlifting (costochondritis); generally reproducible with palpation of joints	204
Clavicles	Common sites of fracture, often after falling onto outstretched limb or onto shoulder; fractures typically occur in middle third; supraclavicular nerve block relieves pain associated with fracture	203
Sternal angle (of Louis)	Surface landmark for counting ribs (2nd pair of ribs articulate between manubrium and body of sternum) and intercostal spaces; divides superior from inferior mediastinum, and marks transition from aortic arch to descending thoracic aorta	203
Superior thoracic aperture	Compression of neurovascular structures (inferior trunk of brachial plexus and great vessels) that traverse superior thoracic aperture may produce thoracic outlet syndrome	213
Intercostal spaces	Relationship of intercostal neurovascular bundle to ribs is crucial when placing chest tube to relieve pneumothorax or hemothorax, or needles to anesthetize nerves; tubes should be inserted along superior margin of ribs to avoid these bundles; of note, however, intercostal nerve may have collateral branch running along superior border of lower rib, which can result in pain	210, 238
Median cricothyroid ligament	Also known as cricothyroid membrane; site of cricothyrotomy, an emergency procedure to establish surgical airway	53, 103
Muscular System		
Diaphragm	Widening of esophageal hiatus at T8 vertebral level or congenital defect allows for protrusion of stomach into thorax (hiatal hernia), which increases incidence of gastroesophageal reflux	216, 257

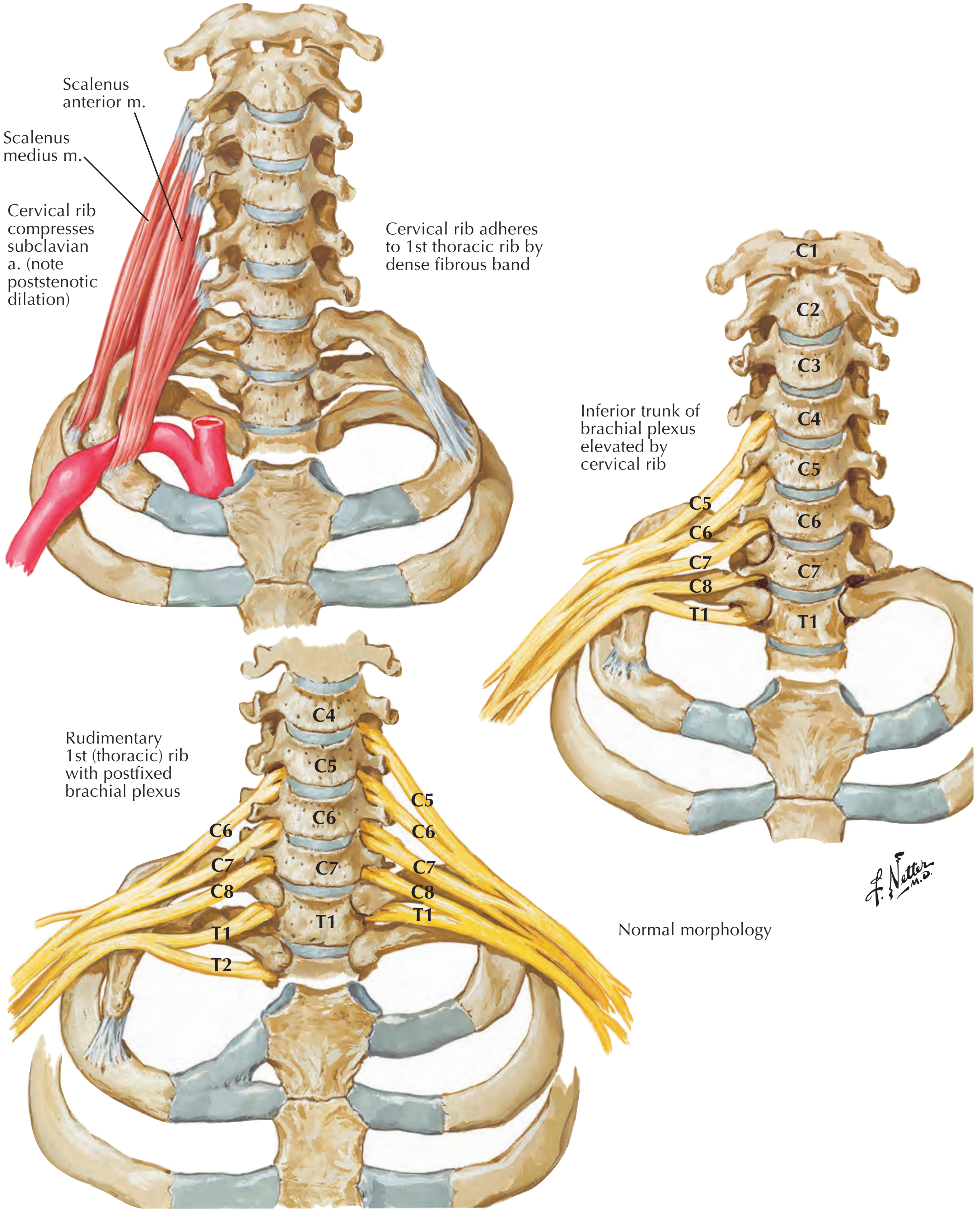
ANATOMICAL STRUCTURE	CLINICAL COMMENT	PLATE NUMBERS
Cardiovascular System		
Internal thoracic artery	Commonly used for coronary artery bypass grafts, most often for anterior interventricular artery (left anterior descending artery)	211, 212
Pulmonary arteries	Thromboemboli, most often from pelvic and femoral sources, may obstruct pulmonary arteries (pulmonary embolus), leading to hypoxemia, hemodynamic compromise, and pulmonary infarction	220, 227
Pericardium	Pericardial space can contain small amounts of physiologic fluid (15–50 mL); effusion may compromise heart function (cardiac tamponade); pericardial sac can expand and become quite large with slow, progressive fluid accumulation	231, 236
Coronary arteries	Fixed atherosclerotic disease may cause myocardial ischemia to manifest as thoracic pain; rupture and thrombosis of atherosclerotic plaque is main cause of acute myocardial infarction; severity and outcomes depend on amount of myocardium that vessel subtends, with proximal lesions of large vessels being most morbid	239
Pulmonary veins	Atrial fibrillation, a common arrhythmia, is believed to originate from within pulmonary veins; electrical ablation of this arrhythmia creates rings of fibrosis around pulmonary veins as they enter left atrium, thereby preventing propagation of electrical signals into heart	242, 247
Foramen ovale	Provides channel for interatrial flow (right-to-left shunt) during fetal development; remains patent in approximately one in four adults and may provide route for venous microthromboses to enter left side of heart and cause ischemic stroke	242
Interventricular septum	Ventricular septal defect is common congenital cardiac defect, most often involving membranous portion of septum; myocardial infarction in territory of anterior interventricular artery (left anterior descending artery), especially if not promptly treated, may generate sufficient ischemia of septum to cause perforation	242, 245
Heart valves	Valvular disease (e.g., aortic stenosis, mitral insufficiency) is common, especially among older adults, and may cause progressive heart failure	243
Aortic valve	1% of population has bicuspid aortic valve (i.e., containing two rather than three leaflets), which predisposes to aortic stenosis and insufficiency and is also associated with aortic aneurysm	243, 244
Sinuatrial node	Primary cardiac pacemaker, which generates action potentials that propagate through cardiac conduction system; aging, infiltrative diseases, and heart surgery may cause sinus node dysfunction, resulting in bradycardia	248
Atrioventricular node	Conducts action potentials from atria to ventricles; intrinsic refractory period prevents rapid atrial rhythms from causing equivalent tachycardia of ventricles; dysfunction secondary to fibrosis, medications, cardiac surgery may result in heart block; when block is complete, atria and ventricles have independent rhythms	248
Ligamentum arteriosum	Remnant of ductus arteriosus, which connects pulmonary and systemic circulations during fetal development; lack of ductus closure after birth may cause exertional dyspnea, pulmonary vascular disease, or heart failure; acts as landmark to identify left recurrent laryngeal nerve looping inferior to ligament	232, 247
Thoracic aorta	Lies naturally to left of vertebral column in thorax and commences at T4 vertebral level, where aortic arch terminates; congenital coarctation (narrowing) of aorta may cause hypertension in children and young adults; significant difference in blood pressure between upper and lower extremities is suggestive	258
Thoracic aorta	Aneurysm (enlargement) may occur secondary to age and atherosclerotic risk factors (such as tobacco abuse and hypertension), connective tissue disorders, in association with bicuspid aortic valve, or from infection (e.g., syphilis). Large aneurysm can rupture or dissect; the latter occurs when a tear in intimal layer allows blood to propagate into a false lumen between intima and media	258

ANATOMICAL STRUCTURE	CLINICAL COMMENT	PLATE NUMBERS
Cardiovascular System—Continued		
Azygos vein	Drains posterior thorax and provides important collateral channel between inferior vena cava and superior vena cava	259
Lymph Vessels and Lymphoid Organs		
Lymph vessels of breast	Metastatic spread of cancer cells from mammary gland to axilla and thorax via lymphatics draining breast	208
Axillary nodes	Primary nodes that receive lymphatic drainage from upper limb, thoracic wall, and breast; commonly enlarged in patients with breast cancer	207, 208
Respiratory System		
Pleura	Air or gas (spontaneous or traumatic) can leak into pleural space between visceral pleura and parietal pleura and compress lung, a condition known as pneumothorax; if severe enough to compromise venous return to heart, resulting in hypotension and dyspnea, condition is known as tension pneumothorax	217–220
Cervical pleura	Extends into neck superior to anterior aspect of angled 1st rib or to level of 1st rib posteriorly; it may therefore be punctured during neck procedures, producing pneumothorax	69, 217
Tracheal bifurcation	Important landmark when assessing position of endotracheal tube, which should terminate 4–5 cm above; often at T4–T5 vertebral level; right main bronchus is shorter, more vertical, and wider; therefore, aspirated objects more often enter right side; left main bronchus lies over esophagus and posterior to left atrium of heart	225
Apex of lung	Pancoast tumor (bronchogenic carcinoma of apex of lung) may compress sympathetic trunk, resulting in Horner's syndrome (ipsilateral miosis, ptosis, anhidrosis, facial flushing); apex is susceptible to pneumothorax from needles introduced in lower neck region	217, 251
Reproductive System		
Mammary gland	Breast cancer is most common malignancy in women; most common type originates in lactiferous duct and can either be localized within duct (ductal carcinoma in situ) or invasive into adjoining tissues (invasive ductal carcinoma)	205

*Selections were based largely on clinical data and commonly discussed clinical correlations in macroscopic ("gross") anatomy courses.

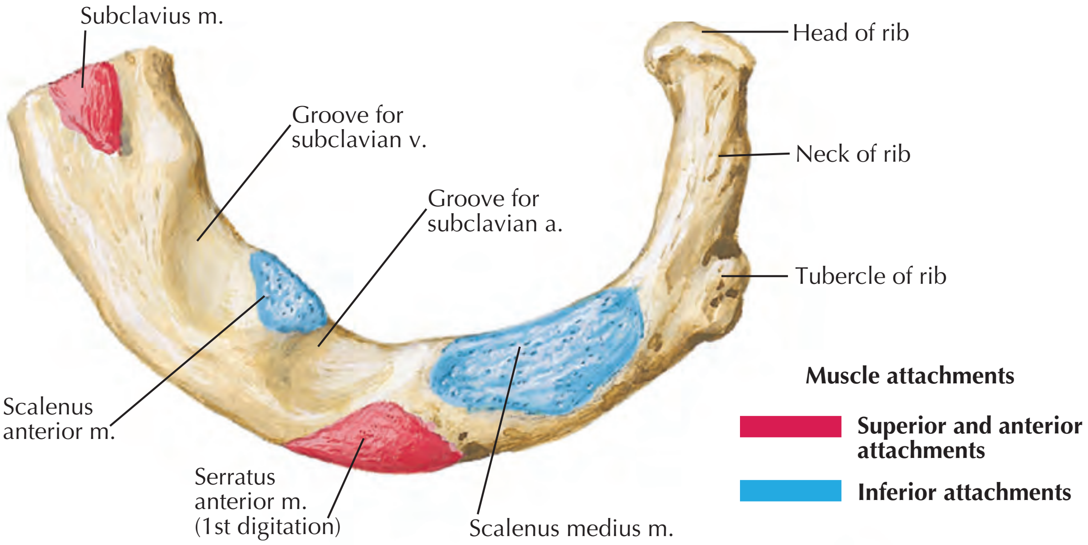
MUSCLE	MUSCLE GROUP	ORIGIN ATTACHMENT	INSERTION ATTACHMENT	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Diaphragm	Diaphragm	Xiphoid process, costal cartilages 7–12, L1–L3 vertebrae	Central tendon	Phrenic nerve	Pericardiacophrenic, musculophrenic, posterior intercostal, and superior and inferior phrenic arteries	Draws central tendon down and forward during inspiration
External intercostal mm.	Thoracic wall	Lower borders of ribs	Upper borders of subjacent ribs	Intercostal nerves	Posterior intercostal arteries, supreme intercostal artery, internal thoracic artery, musculophrenic artery	Support intercostal spaces in inspiration and expiration, elevate ribs in inspiration
Innermost intercostal mm.	Thoracic wall	Lower borders of ribs	Upper borders of subjacent ribs	Intercostal nerves	Posterior intercostal arteries, supreme intercostal artery, internal thoracic artery, musculophrenic artery	Prevent pushing out or drawing in of intercostal spaces in inspiration and expiration, lower ribs in forced expiration
Internal intercostal mm.	Thoracic wall	Costal grooves, lower borders of costal cartilages	Upper borders of subjacent ribs	Intercostal nerves	Posterior intercostal arteries, supreme intercostal artery, internal thoracic artery, musculophrenic artery	Prevent pushing out or drawing in of intercostal spaces in inspiration and expiration, lower ribs in forced expiration
Levatores costarum	Thoracic wall	Transverse processes of C7–T11 vertebrae	Subjacent ribs (between tubercle and angle)	Posterior rami of thoracic spinal nerves	Posterior intercostal arteries	Elevate ribs
Pectoralis major m.	Pectoral region	*Clavicular part:* sternal half of clavicle *Sternal part:* anterior surface of sternum, cartilages of true ribs *Abdominal part:* aponeurosis of external abdominal oblique muscle	Lateral lip of intertubercular sulcus of humerus	Medial and lateral pectoral nerves	Pectoral branch of thoracoacromial artery, internal thoracic artery	Flexes, adducts, and medially rotates arm
Pectoralis minor m.	Pectoral region	External surface of upper margin of ribs 3–5	Coracoid process of scapula	Medial and lateral pectoral nerves	Pectoral branch of thoracoacromial artery, superior and lateral thoracic arteries	Lowers lateral angle of scapula and protracts scapula
Serratus anterior m.	Shoulder	Lateral surfaces of ribs 1–9	Costal surface of medial border of scapula	Long thoracic nerve	Lateral thoracic artery	Protracts and rotates scapula and holds it against thoracic wall
Subclavius m.	Shoulder	Upper border of 1st rib and costal cartilage	Inferior surface of middle one-third of clavicle	Subclavian nerve	Clavicular branch of thoracoacromial artery	Anchors and depresses clavicle
Subcostal mm.	Thoracic wall	Internal surfaces of lower ribs near their angles	Superior borders of ribs that are the 2nd or 3rd below the muscle origin	Intercostal nerves	Posterior intercostal arteries, musculophrenic artery	Depress ribs
Transversus thoracis m.	Thoracic wall	Internal surfaces of costal cartilages 2–6	Posterior surface of lower sternum	Intercostal nerves	Internal thoracic artery	Depresses ribs and costal cartilages

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.

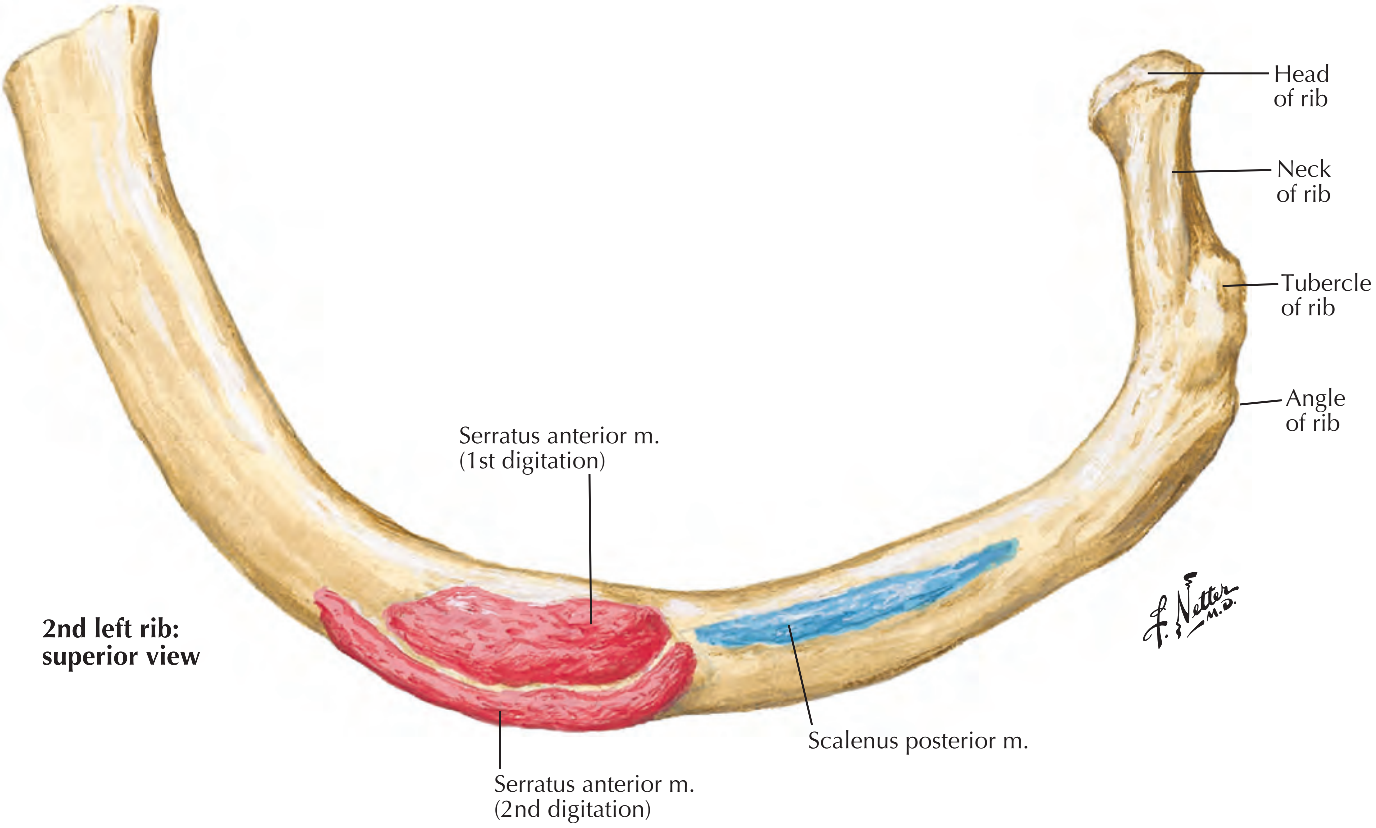

Scalenus anterior m.
Scalenus medius m.
Cervical rib compresses subclavian a. (note poststenotic dilation)
Cervical rib adheres to 1st thoracic rib by dense fibrous band
Inferior trunk of brachial plexus elevated by cervical rib
C1
C2
C3
C4
C5
C6
C7
T1
C5
C6
C7
C8
T1
Normal morphology
Rudimentary 1st (thoracic) rib with postfixed brachial plexus
C4
C5
C6
C7
T1
C6
C7
C8
T1
T2
C5
C6
C7
C8
T1
F. Netter M.D.

Muscle Attachments of Ribs

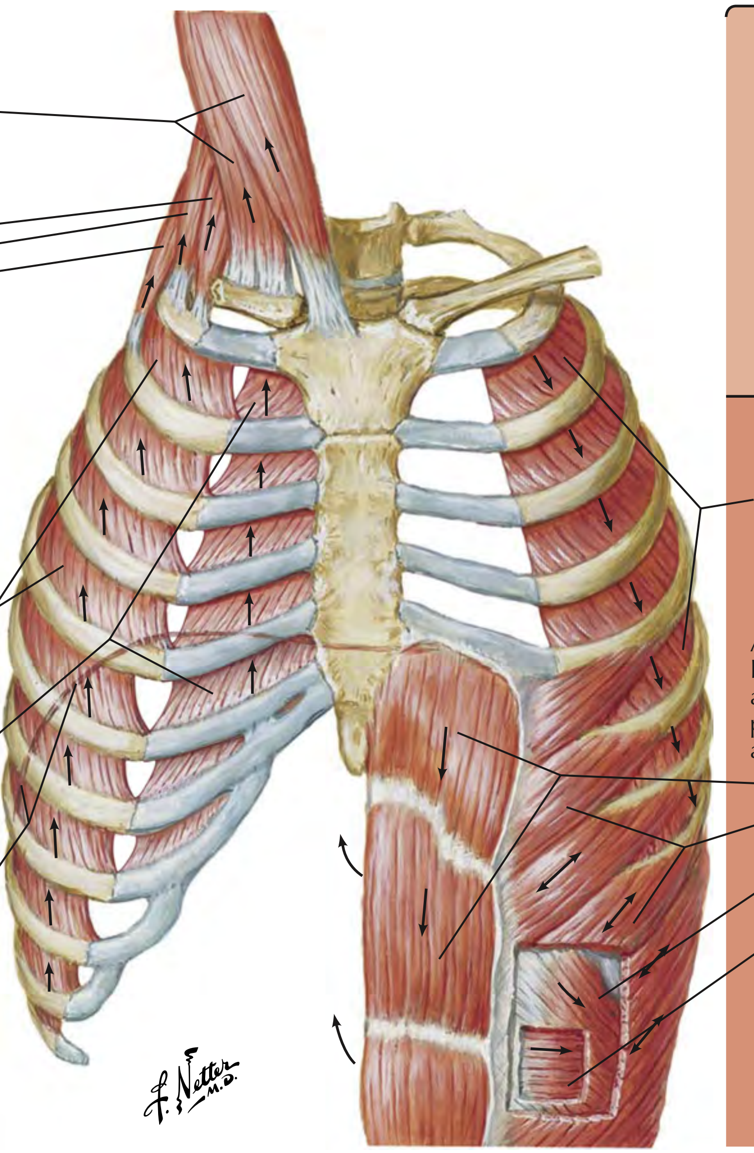
1st left rib: superior view


Subclavius m.
Head of rib
Groove for subclavian v.
Neck of rib
Groove for subclavian a.
Tubercle of rib
Muscle attachments
🟥 Superior and anterior attachments
🟦 Inferior attachments
Scalenus anterior m.
Serratus anterior m. (1st digitation)
Scalenus medius m.

2nd left rib: superior view


Head of rib
Neck of rib
Tubercle of rib
Angle of rib
Serratus anterior m. (1st digitation)
Scalenus posterior m.
Serratus anterior m. (2nd digitation)

See Plates 54, 210, 211



Muscles of inspiration

Accessory muscles

Sternocleidomastoid m. (elevates sternum and clavicle)

Scalenus mm. (elevate and fix upper ribs)
Scalenus anterior m.
Scalenus medius m.
Scalenus posterior m.

Principal muscles

External intercostal mm. (elevate ribs, thus increasing width of thoracic cavity and aiding deep inspiration)

Interchondral parts of internal intercostal mm. (also elevate ribs and aid with deep inspiration)

Diaphragm (domes descend, thus increasing vertical dimension of thoracic cavity; also elevates lower ribs)

Muscles of expiration

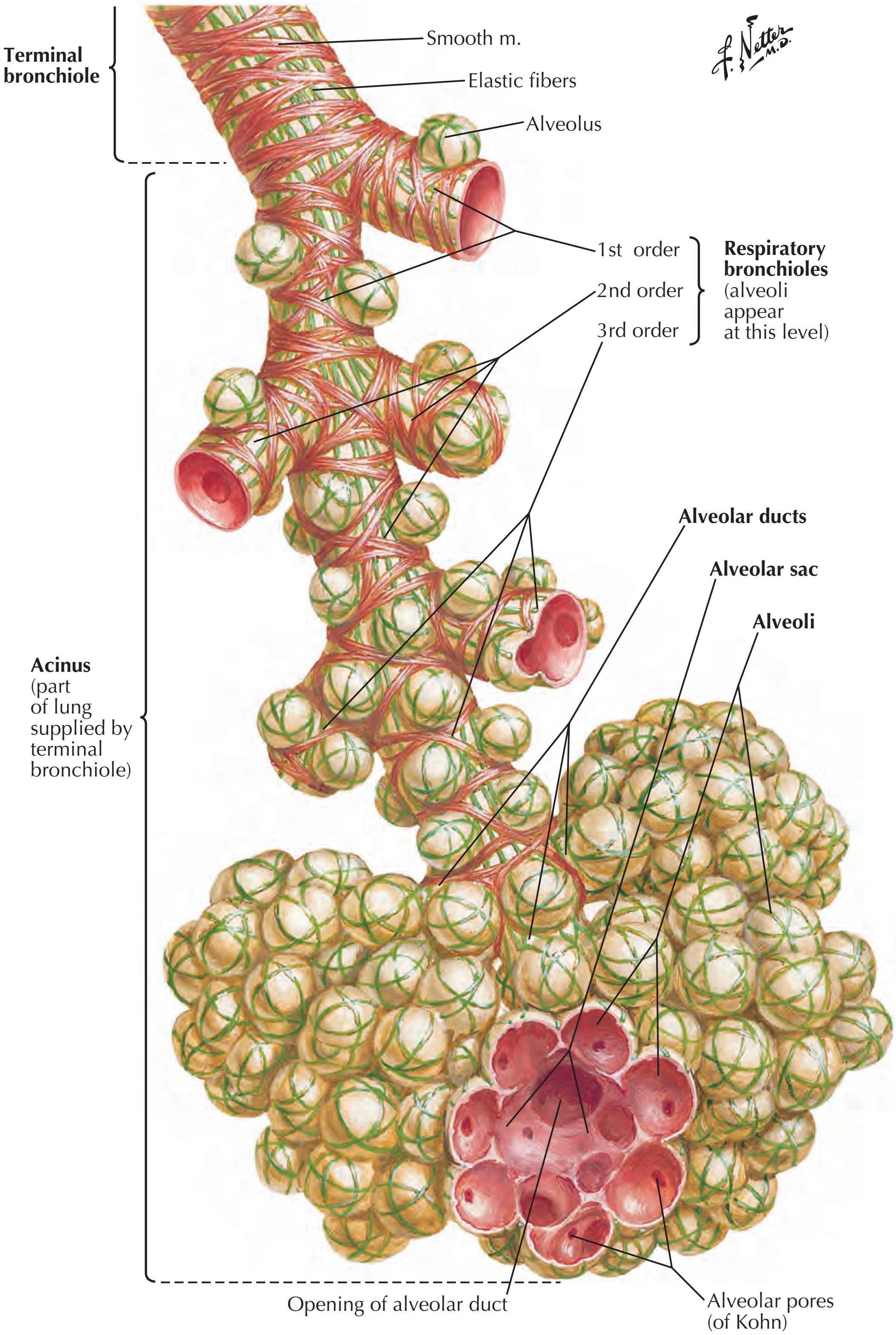
Quiet breathing

Expiration results from passive recoil of lungs and rib cage

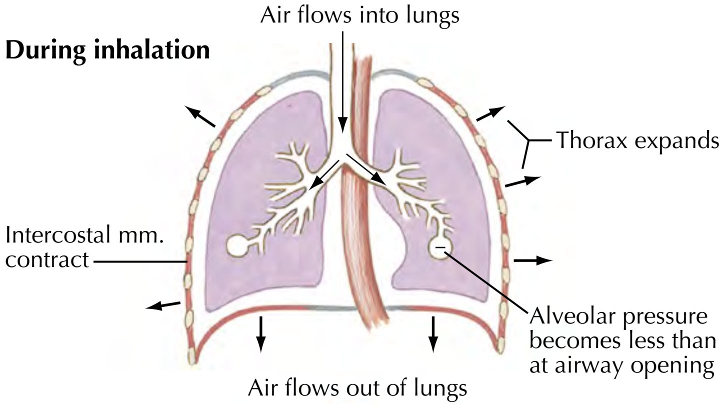
Active breathing

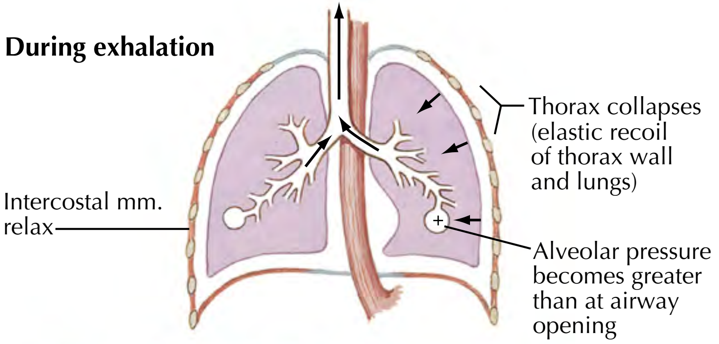
Internal intercostal mm., except interchondral part (aid forced expiration)

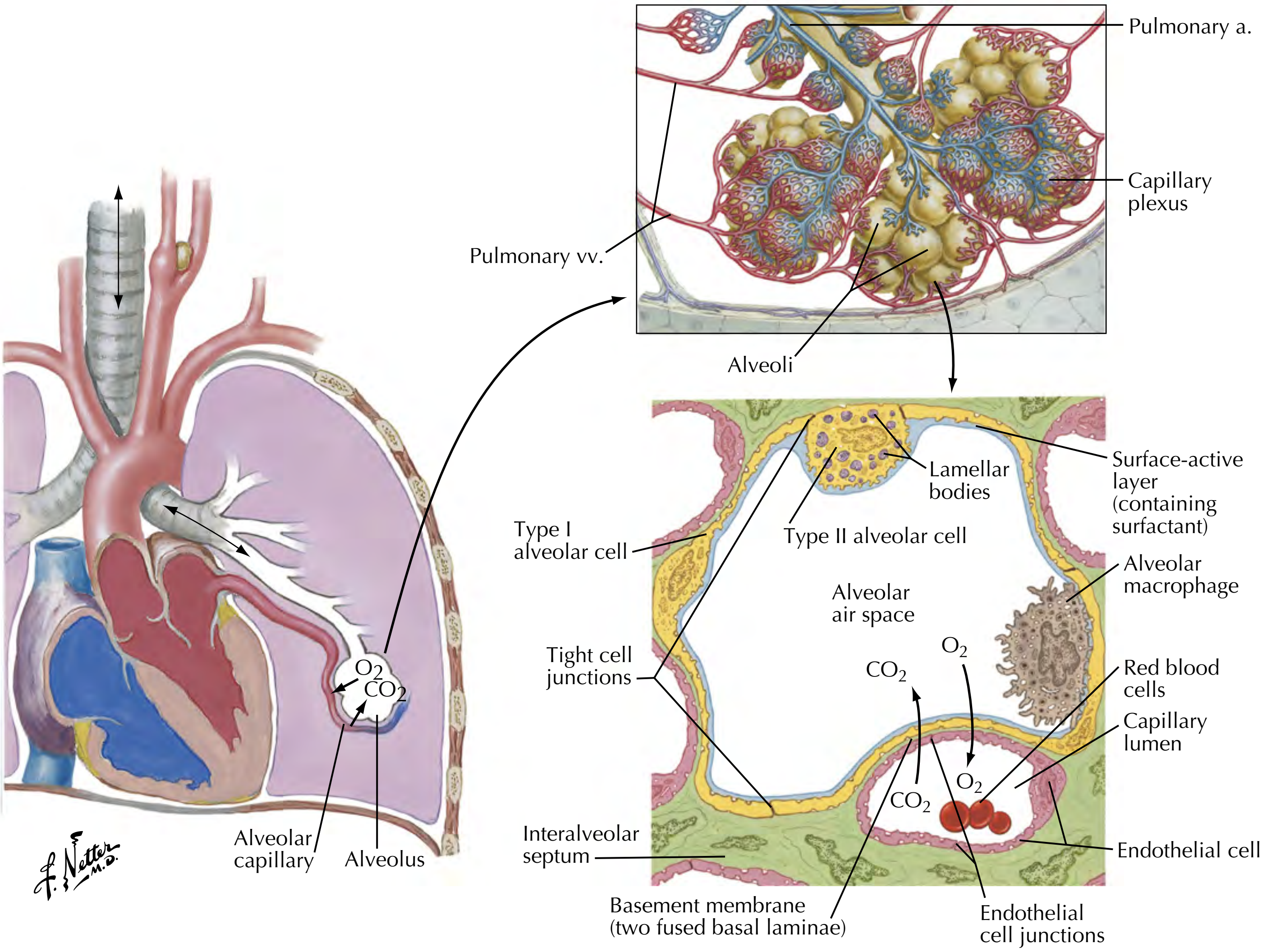
Abdominal mm. (depress lower ribs, compress abdominal contents, thus pushing up diaphragm, aiding forced expiration)
Rectus abdominis m.
External abdominal oblique m.
Internal abdominal oblique m.
Transversus abdominis m.


Terminal bronchiole
Smooth m.
Elastic fibers
Alveolus
1st order
2nd order
3rd order
Respiratory bronchioles (alveoli appear at this level)
Acinus (part of lung supplied by terminal bronchiole)
Alveolar ducts
Alveolar sac
Alveoli
Opening of alveolar duct
Alveolar pores (of Kohn)

Structure of intrapulmonary airways


During inhalation
Air flows into lungs
Thorax expands
Intercostal mm. contract
Alveolar pressure becomes less than at airway opening
−


During exhalation
Air flows out of lungs
Thorax collapses (elastic recoil of thorax wall and lungs)
Intercostal mm. relax
Alveolar pressure becomes greater than at airway opening
+


Pulmonary a.
Capillary plexus
Pulmonary vv.
Alveoli
Alveolar capillary
Alveolus
O_2
CO_2
Lamellar bodies
Surface-active layer (containing surfactant)
Type I alveolar cell
Type II alveolar cell
Alveolar macrophage
Alveolar air space
Tight cell junctions
Red blood cells
Capillary lumen
Endothelial cell
Interalveolar septum
Basement membrane (two fused basal laminae)
Endothelial cell junctions
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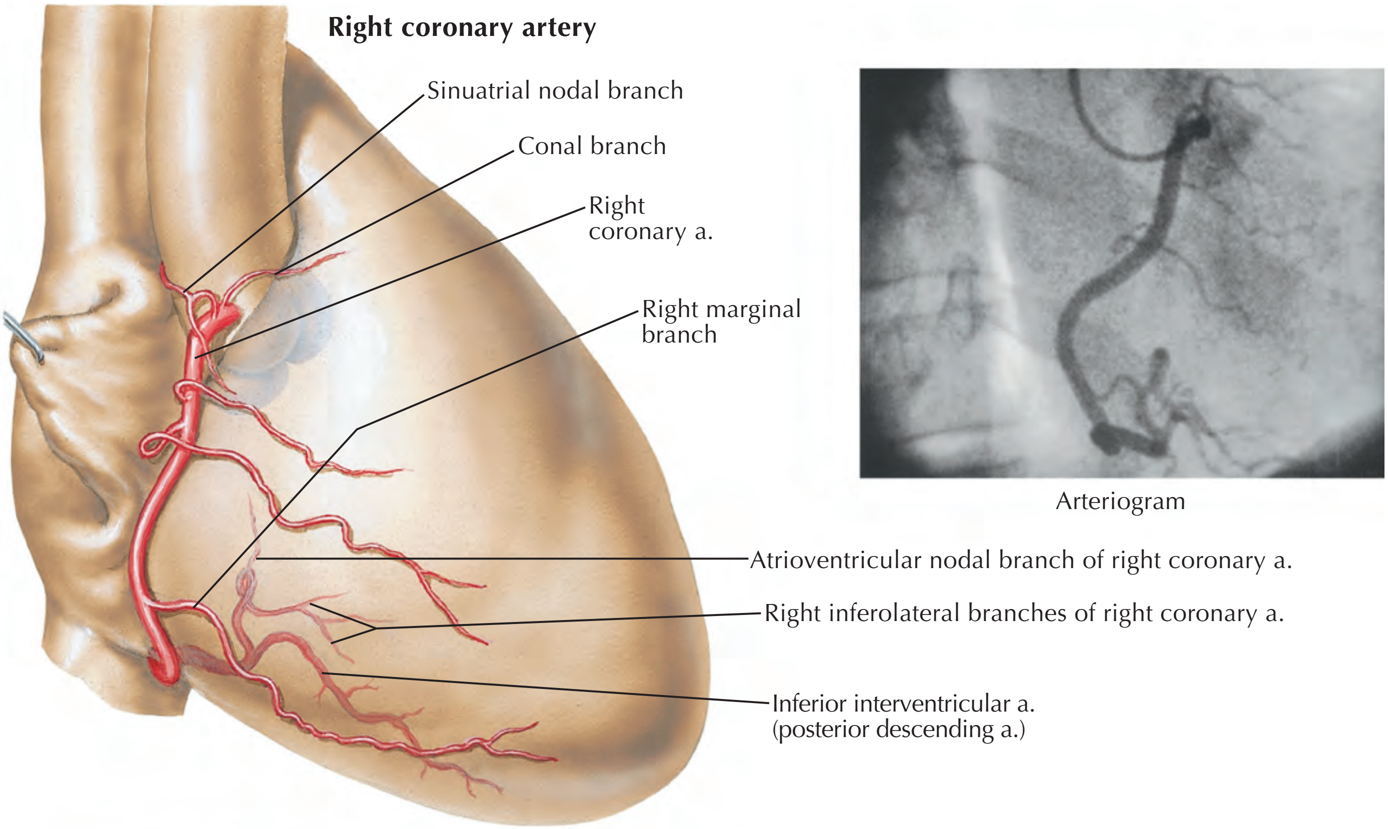
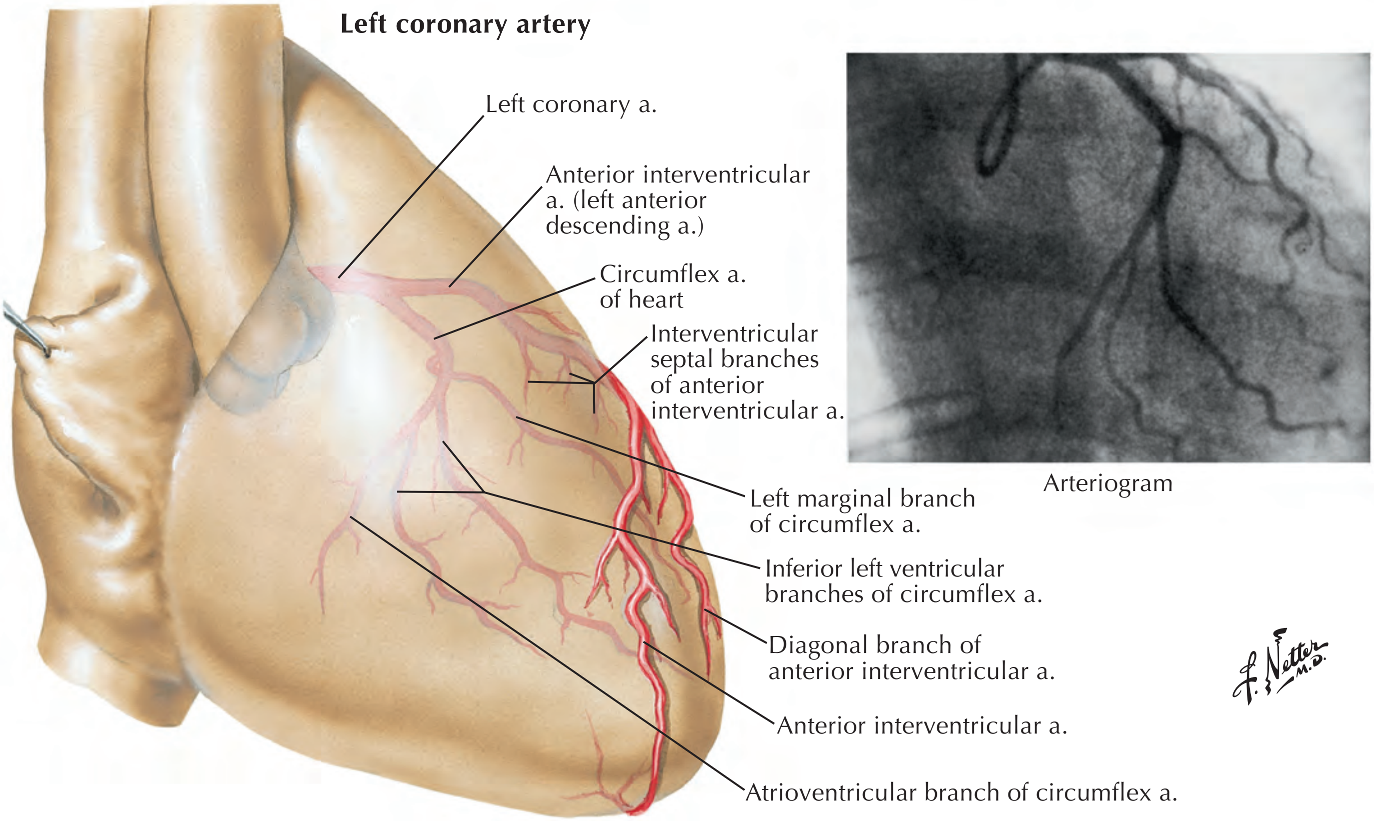
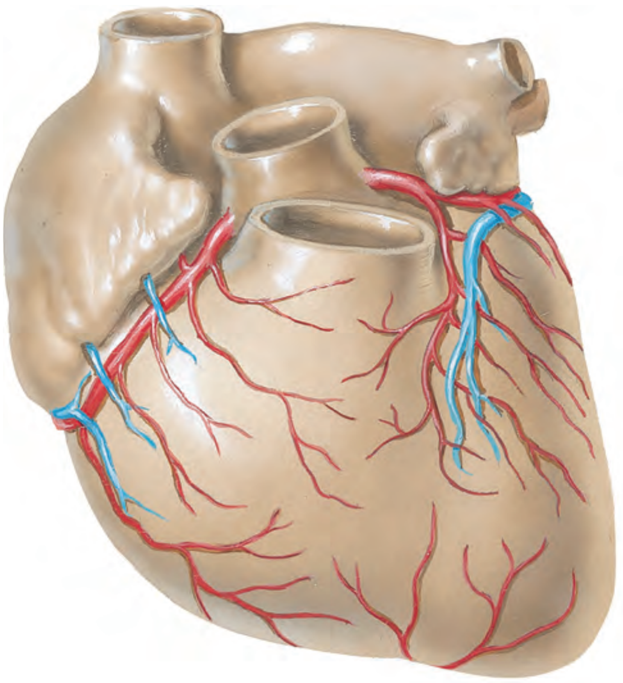
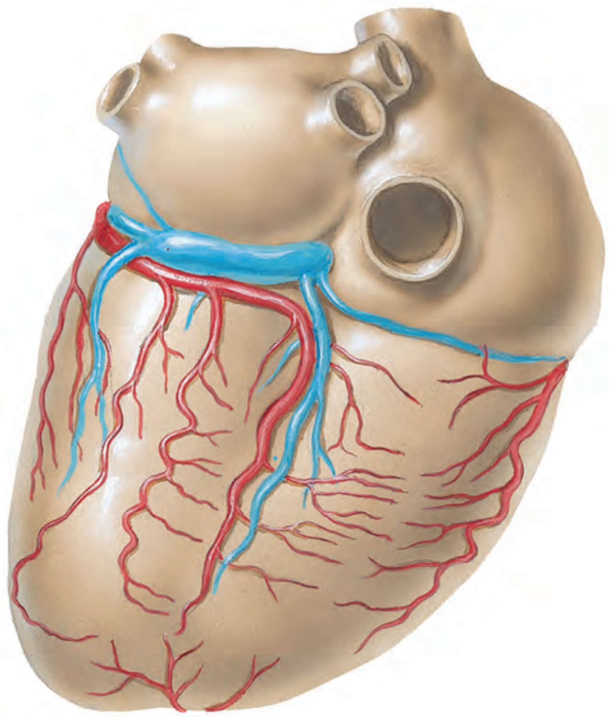
Coronary Arteries: Right Anterolateral Views with Arteriograms


Right coronary artery
Sinuatrial nodal branch
Conal branch
Right coronary a.
Right marginal branch
Atrioventricular nodal branch of right coronary a.
Right inferolateral branches of right coronary a.
Inferior interventricular a. (posterior descending a.)
Arteriogram

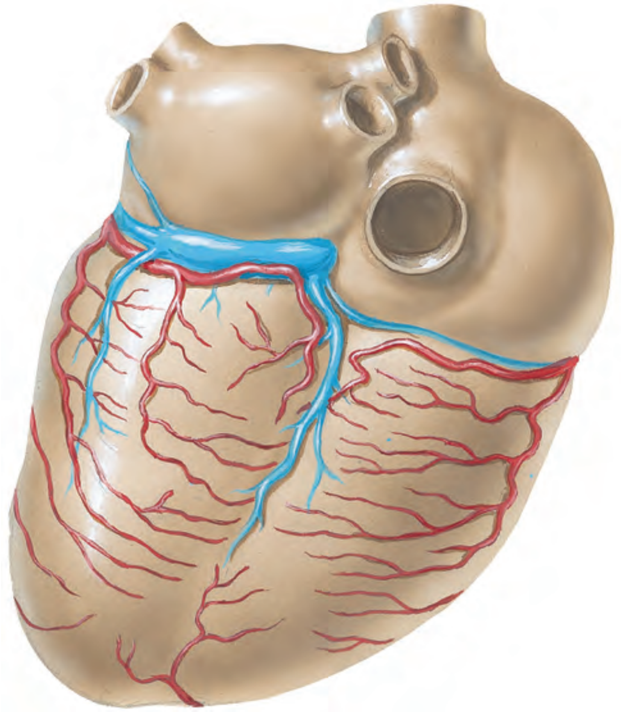

Left coronary artery
Left coronary a.
Anterior interventricular a. (left anterior descending a.)
Circumflex a. of heart
Interventricular septal branches of anterior interventricular a.
Left marginal branch of circumflex a.
Inferior left ventricular branches of circumflex a.
Diagonal branch of anterior interventricular a.
Anterior interventricular a.
Atrioventricular branch of circumflex a.
Arteriogram



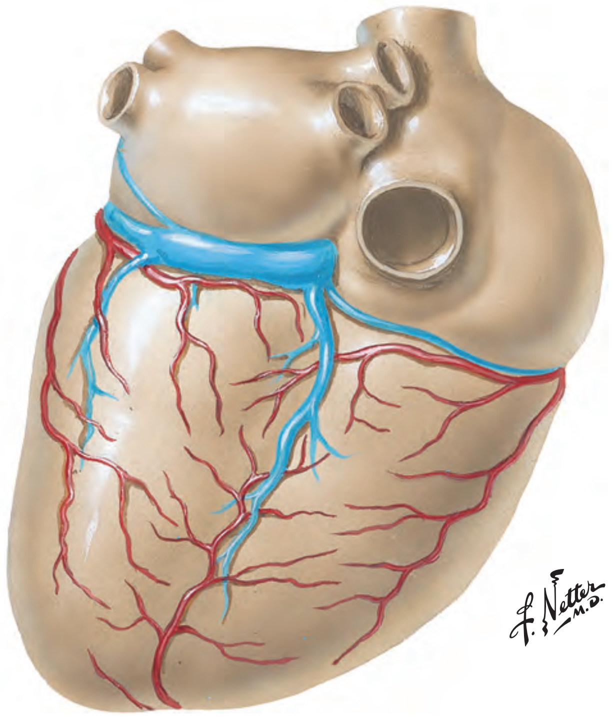
Anterior interventricular artery (left anterior descending artery) is very short. Apical part of anterior surface of heart is supplied by branches from inferior interventricular artery (posterior descending artery) curving around apex.



Inferior interventricular artery (posterior descending artery) is derived from circumflex artery of heart instead of from right coronary artery.

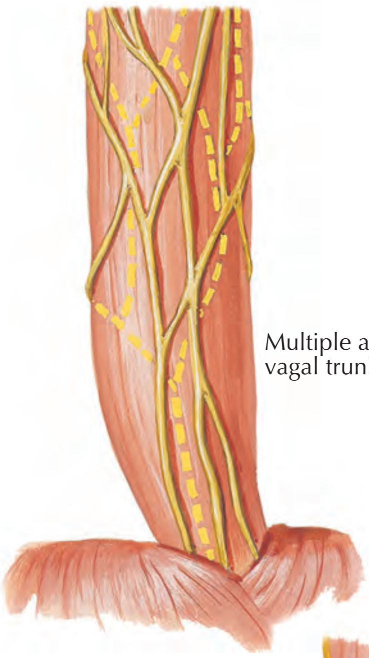


Inferior interventricular artery (posterior descending artery) is absent. Area is supplied chiefly by small branches from circumflex artery of heart and from right coronary artery.

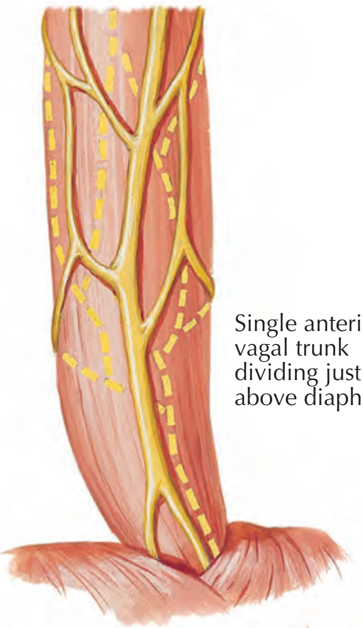


Inferior interventricular artery (posterior descending artery) is absent. Area is supplied chiefly by elongated anterior interventricular artery (left anterior descending artery) curving around apex of heart.

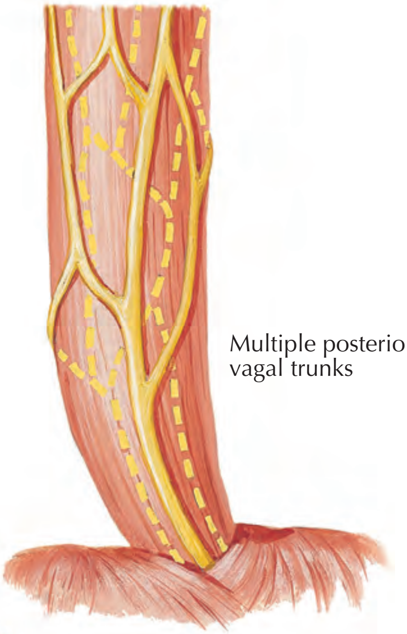
Intrinsic Nerves and Variations in Nerves of Esophagus



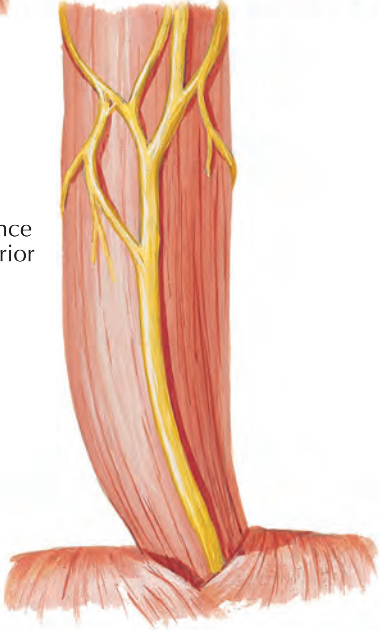
Multiple anterior vagal trunks



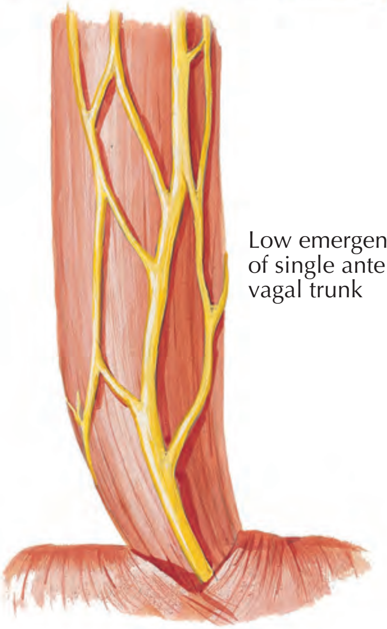
Single anterior vagal trunk dividing just above diaphragm



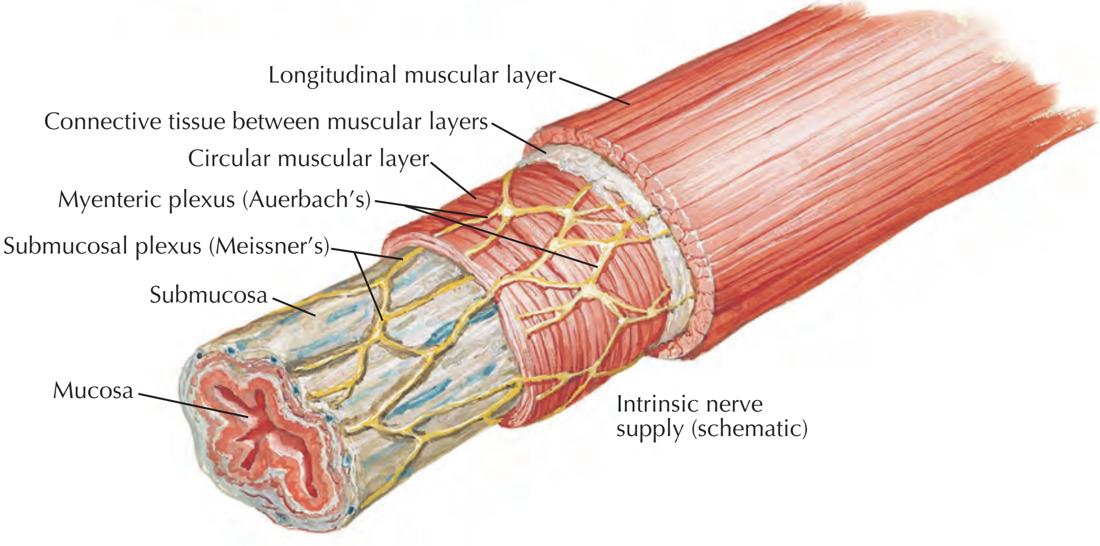
Multiple posterior vagal trunks



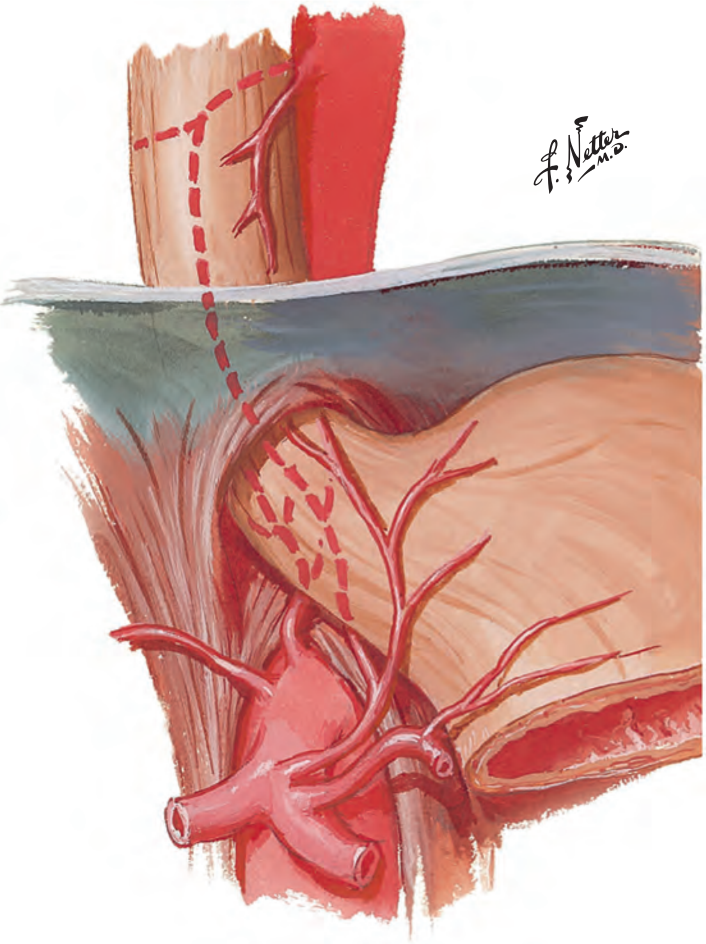
High emergence of single anterior vagal trunk



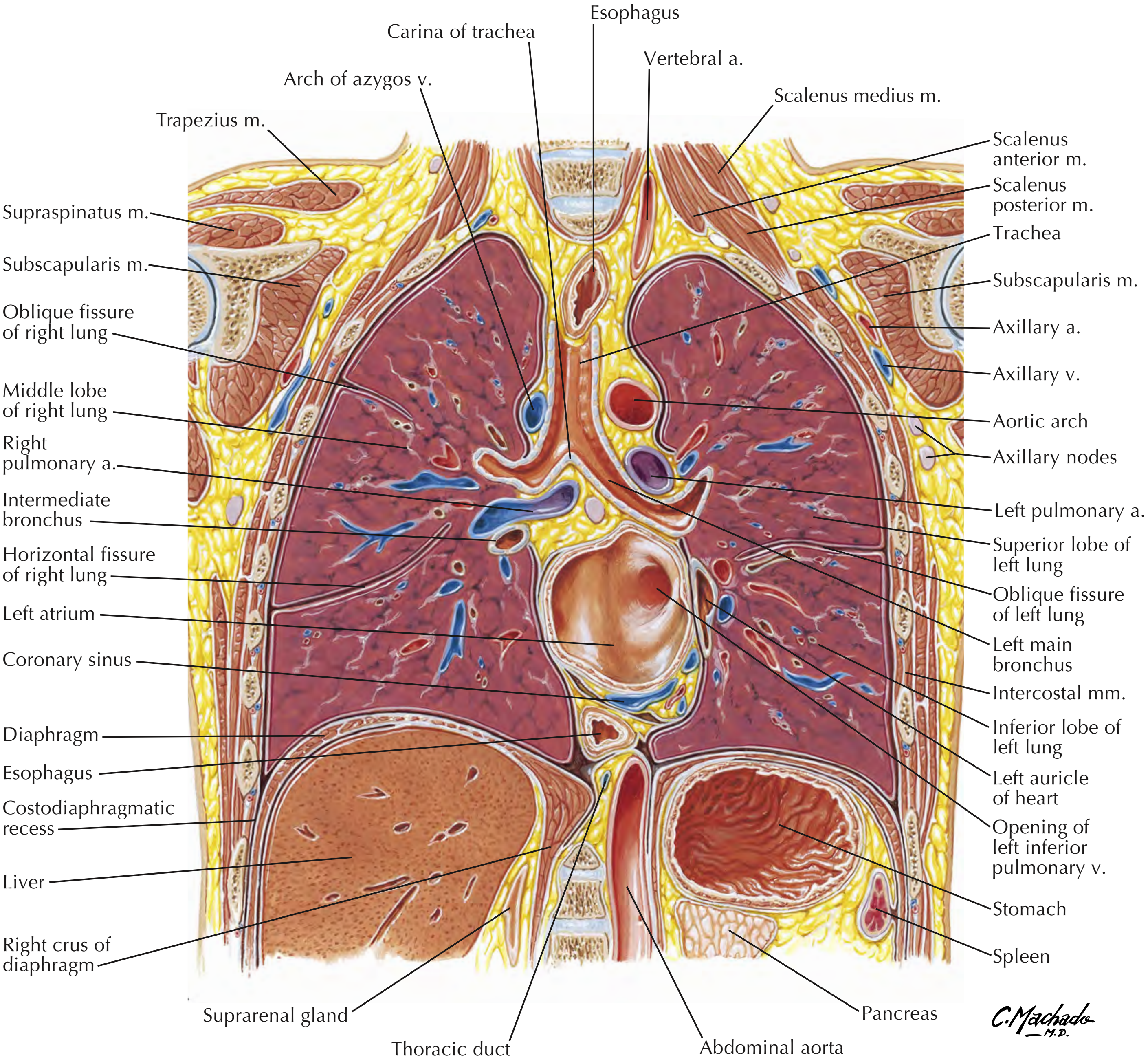
Low emergence of single anterior vagal trunk


Longitudinal muscular layer
Connective tissue between muscular layers
Circular muscular layer
Myenteric plexus (Auerbach's)
Submucosal plexus (Meissner's)
Submucosa
Mucosa

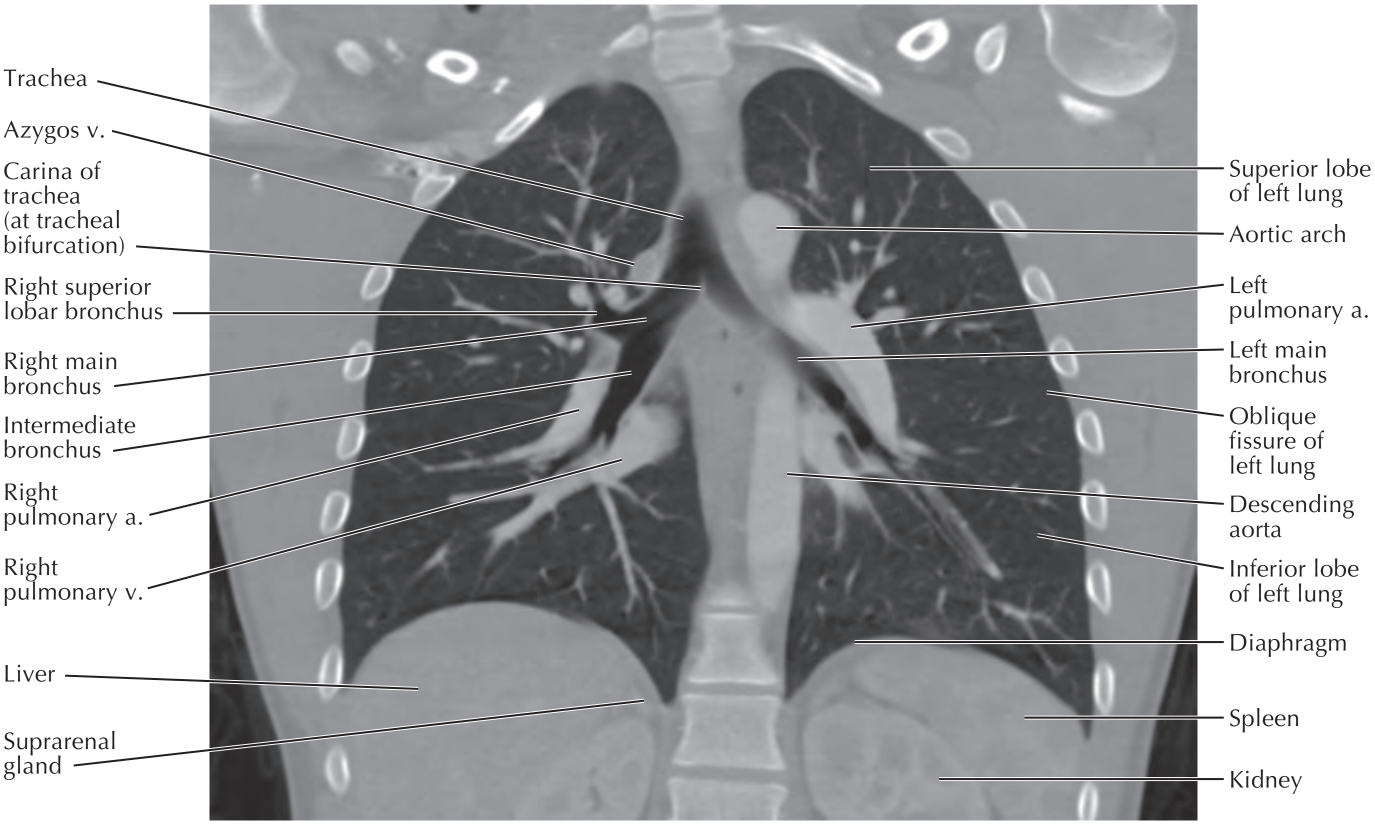
Intrinsic nerve supply (schematic)



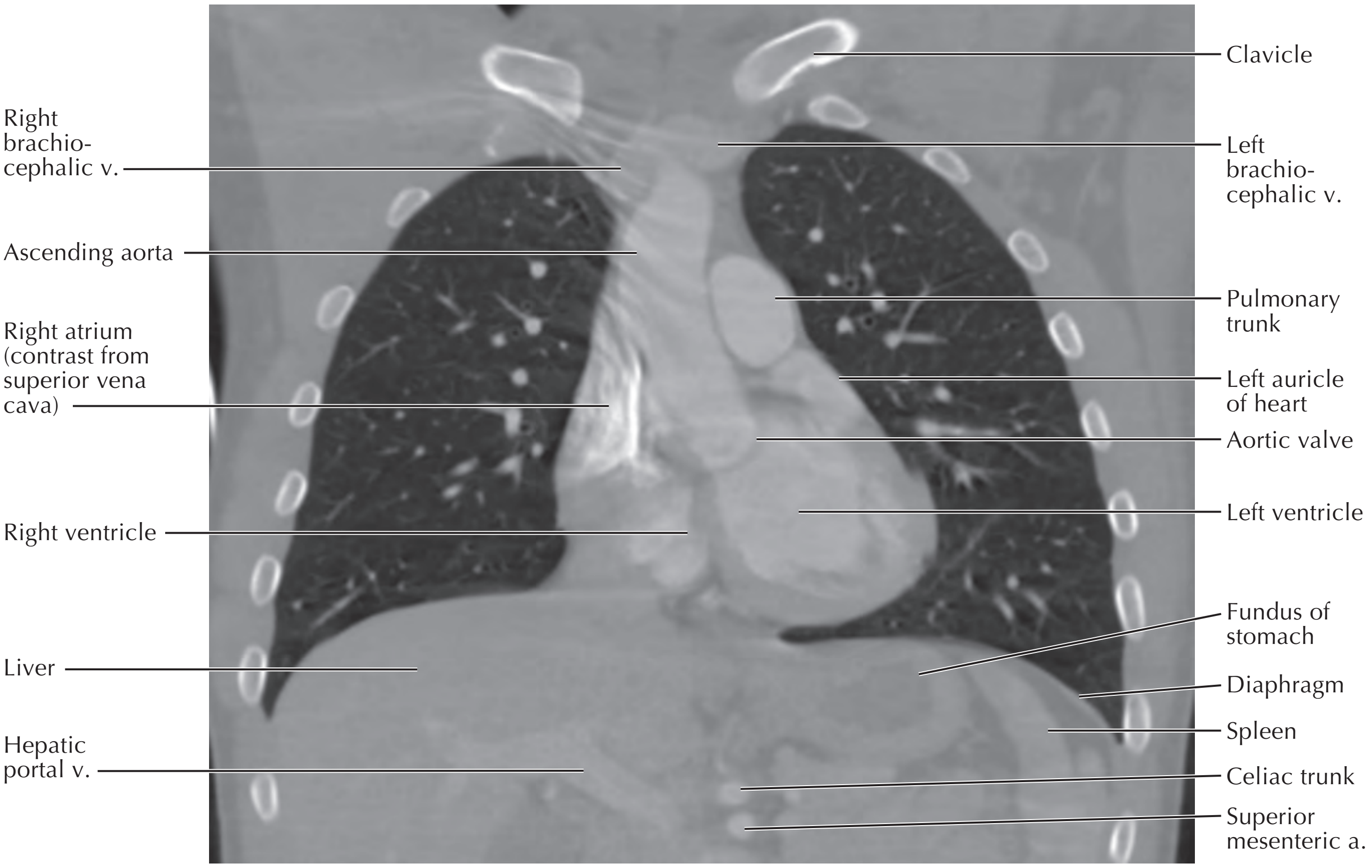
Common variations: Esophageal branches may originate from left inferior phrenic artery and/or directly from celiac trunk. Branches to abdominal esophagus may also come from splenic or short gastric arteries.

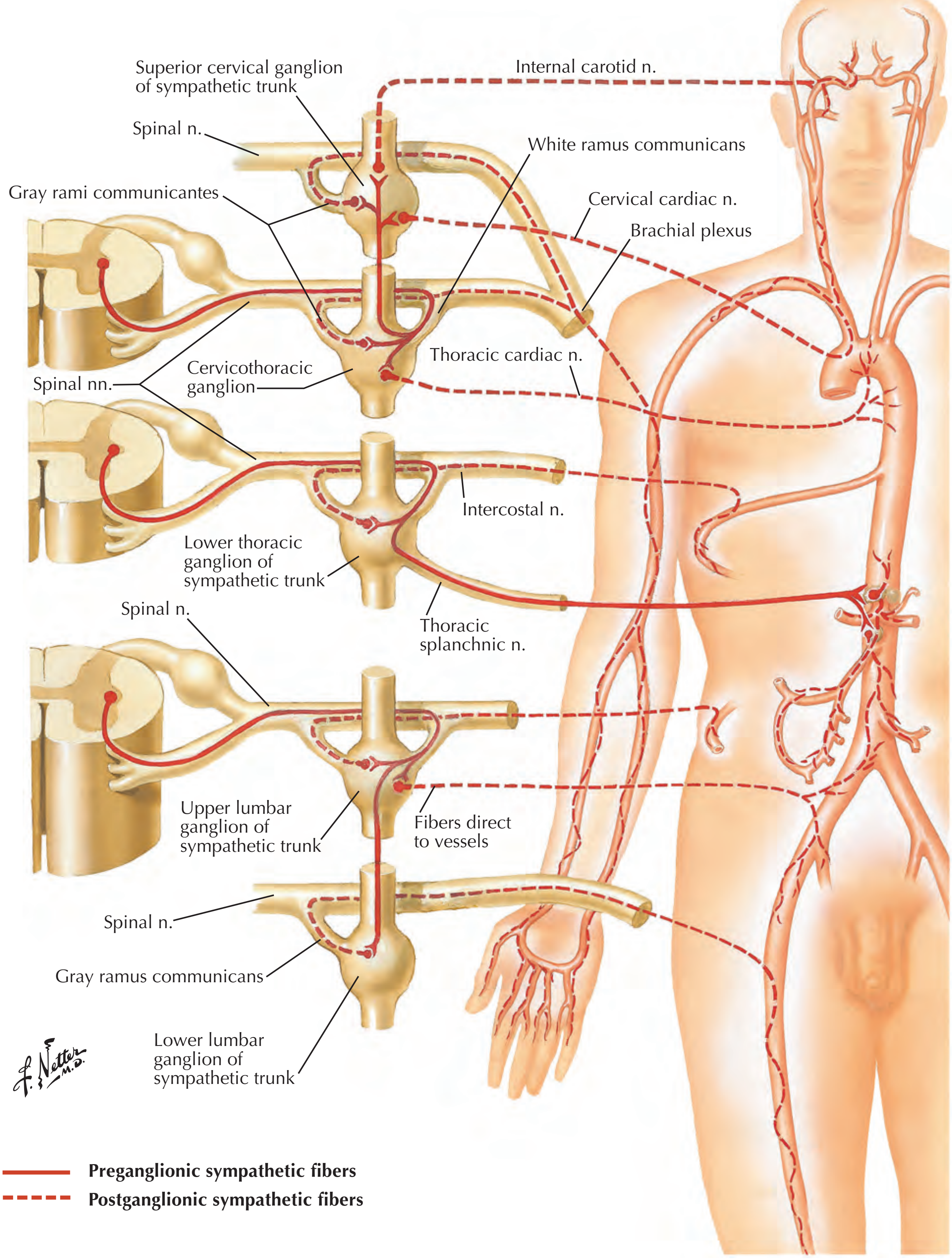

Esophagus
Carina of trachea
Vertebral a.
Arch of azygos v.
Scalenus medius m.
Trapezius m.
Scalenus anterior m.
Scalenus posterior m.
Supraspinatus m.
Trachea
Subscapularis m.
Subscapularis m.
Axillary a.
Oblique fissure of right lung
Axillary v.
Middle lobe of right lung
Aortic arch
Right pulmonary a.
Axillary nodes
Intermediate bronchus
Left pulmonary a.
Superior lobe of left lung
Horizontal fissure of right lung
Oblique fissure of left lung
Left atrium
Left main bronchus
Coronary sinus
Intercostal mm.
Inferior lobe of left lung
Diaphragm
Esophagus
Left auricle of heart
Costodiaphragmatic recess
Opening of left inferior pulmonary v.
Liver
Stomach
Right crus of diaphragm
Spleen
Suprarenal gland
Pancreas
Thoracic duct
Abdominal aorta
C. Machado M.D.

Contrast windowed to accentuate lungs and bones


Trachea
Azygos v.
Carina of trachea (at tracheal bifurcation)
Right superior lobar bronchus
Right main bronchus
Intermediate bronchus
Right pulmonary a.
Right pulmonary v.
Liver
Suprarenal gland
Superior lobe of left lung
Aortic arch
Left pulmonary a.
Left main bronchus
Oblique fissure of left lung
Descending aorta
Inferior lobe of left lung
Diaphragm
Spleen
Kidney

Contrast windowed to accentuate lungs and bones


Right brachio-cephalic v.
Ascending aorta
Right atrium (contrast from superior vena cava)
Right ventricle
Liver
Hepatic portal v.
Clavicle
Left brachio-cephalic v.
Pulmonary trunk
Left auricle of heart
Aortic valve
Left ventricle
Fundus of stomach
Diaphragm
Spleen
Celiac trunk
Superior mesenteric a.


Superior cervical ganglion of sympathetic trunk
Internal carotid n.
Spinal n.
White ramus communicans
Gray rami communicantes
Cervical cardiac n.
Brachial plexus
Thoracic cardiac n.
Cervicothoracic ganglion
Spinal nn.
Intercostal n.
Lower thoracic ganglion of sympathetic trunk
Spinal n.
Thoracic splanchnic n.
Upper lumbar ganglion of sympathetic trunk
Fibers direct to vessels
Spinal n.
Gray ramus communicans
Lower lumbar ganglion of sympathetic trunk
Preganglionic sympathetic fibers
Postganglionic sympathetic fibers

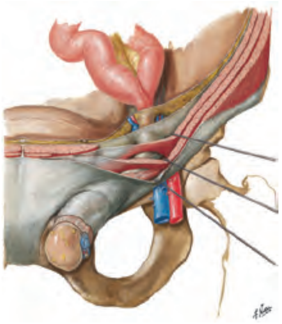
ABDOMEN

5

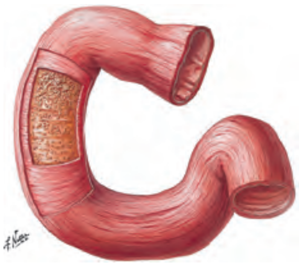
Surface Anatomy 267
Abdominal Wall 268–287
Peritoneal Cavity 288–293
Stomach and Intestines 294–301
Liver, Gallbladder, Pancreas, and Spleen 302–307
Visceral Vasculature 308–318
Visceral Nerves and Plexuses 319–329
Kidneys and Suprarenal Glands 330–343
Lymphatics 344
Regional Imaging 345–346
Cross-Sectional Anatomy 347–351
Structures with High Clinical Significance Tables 5.1–5.3
Muscles Table 5.4
Electronic Bonus Plates BP 53–BP 83

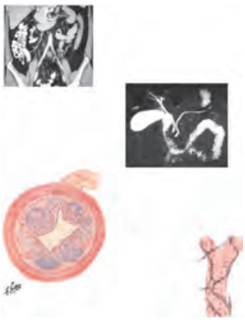
ELECTRONIC BONUS PLATES

BP 53 Inguinal and Femoral Regions


BP 54 Indirect Inguinal Hernia

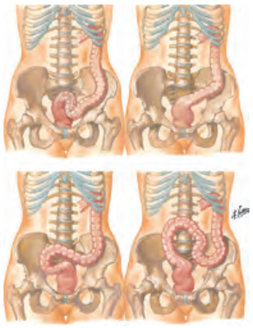
BP 55 Variations in Position and Contour of Stomach in Relation to Body Habitus


BP 56 Layers of Duodenal Wall

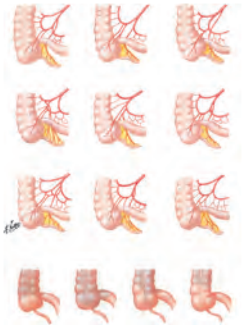

BP 57 CT and MRCP Showing Vermiform Appendix, Gallbladder, and Ducts; Nerve Branches on Hepatic Artery

BP 58 Topography of Liver

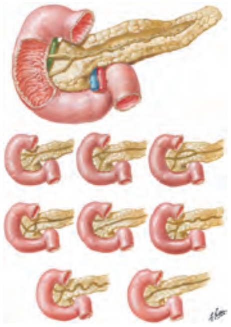
BP 59 Variations in Form of Liver


BP 60 Sigmoid Colon: Variations in Position

ELECTRONIC BONUS PLATES—*cont'd*



BP 61 Variations in Arterial Supply to Cecum and Posterior Peritoneal Attachment of Cecum

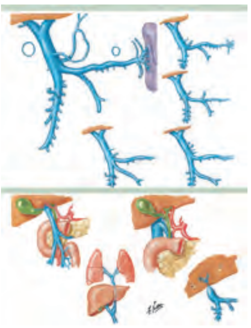


BP 62 Variations in Pancreatic Duct

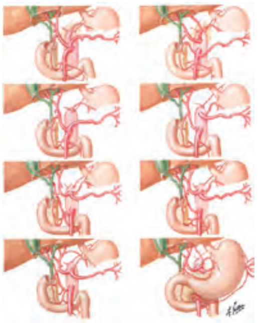
BP 63 Variations in Cystic, Hepatic, and Pancreatic Ducts

BP 64 Variations in Cystic Arteries

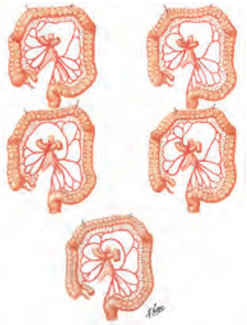
BP 65 Variations in Hepatic Arteries



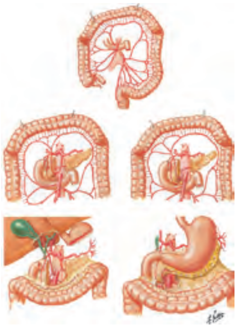
BP 66 Variations and Anomalies of Hepatic Portal Vein



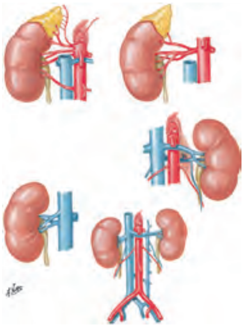
BP 67 Variations in Celiac Trunk



BP 68 Variations in Colic Arteries

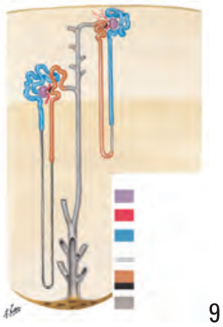


BP 69 Variations in Colic Arteries (continued)



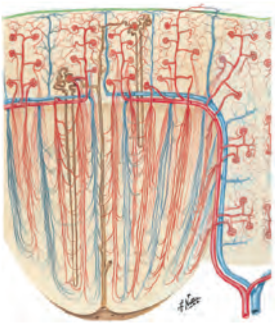
BP 70 Variations in Renal Artery and Vein

BP 71 Histology of Renal Corpuscle



BP 72 Nephron and Collecting Tubule: Schema

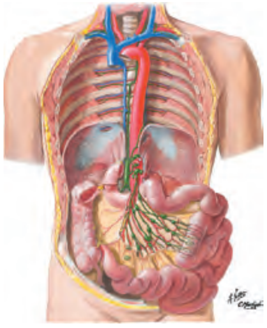
ELECTRONIC BONUS PLATES—*cont'd*



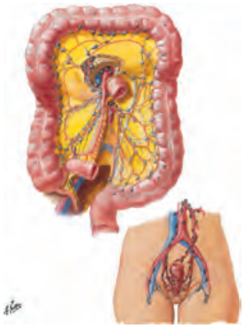
BP 73 Blood Vessels in Parenchyma of Kidney: Schema

BP 74 Lymph Vessels and Lymph Nodes of Stomach

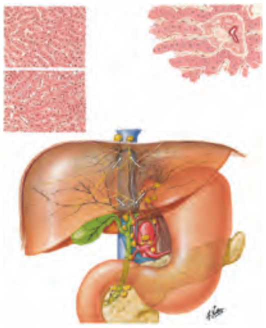
BP 75 Lymph Vessels and Lymph Nodes of Pancreas



BP 76 Lymph Vessels and Lymph Nodes of Small Intestine



BP 77 Lymph Vessels and Lymph Nodes of Large Intestine

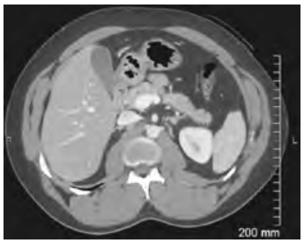


BP 78 Lymph Vessels and Lymph Nodes of Liver

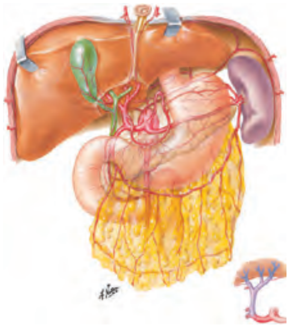
BP 79 Schematic Cross Section of Abdomen at T12 Vertebral Level

BP 80 Transverse Section of Abdomen: L5 Vertebral Level, Near Transtubercular Plane

BP 81 Transverse Section of Abdomen: S1 Vertebral Level, Anterior Superior Iliac Spine

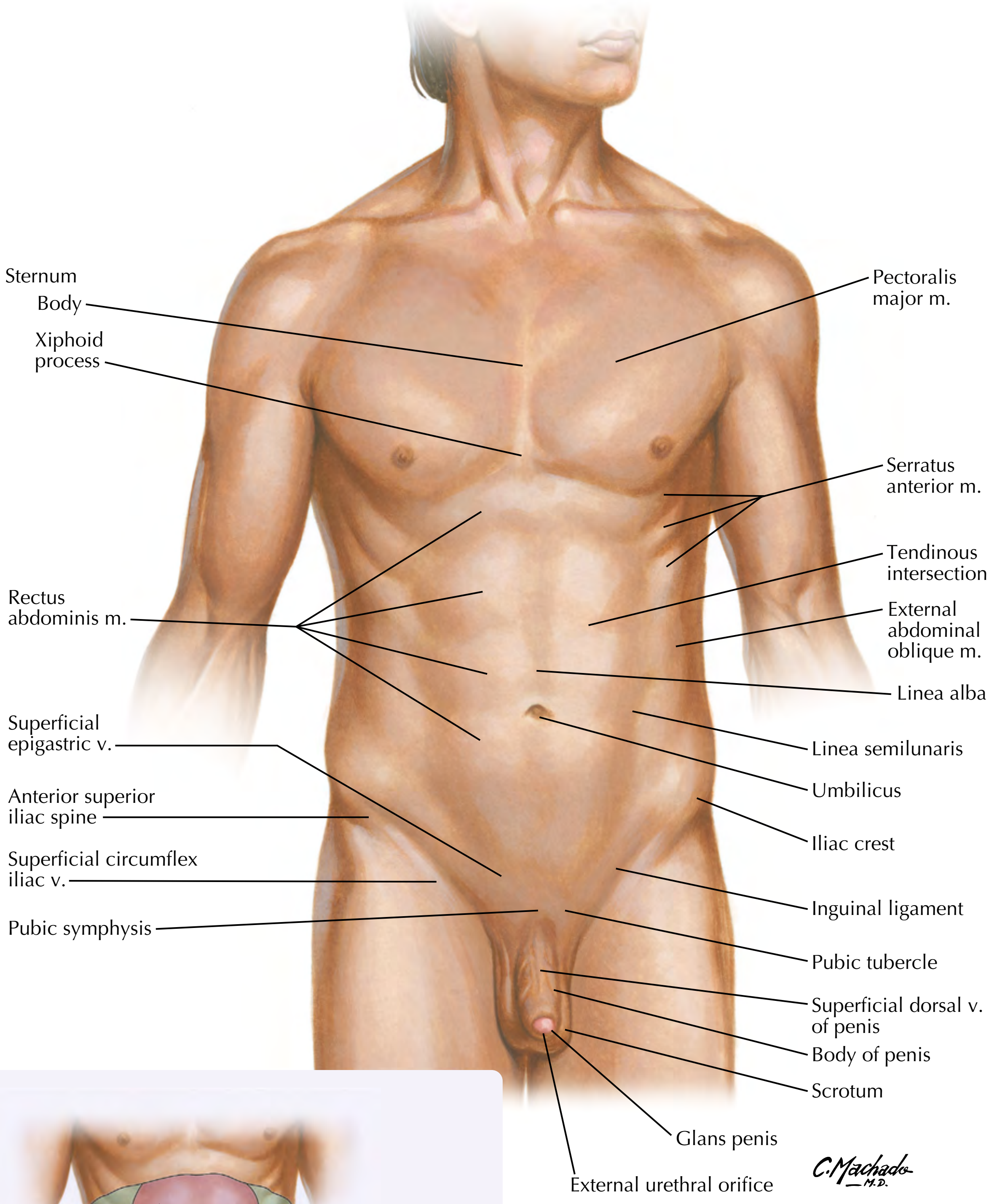


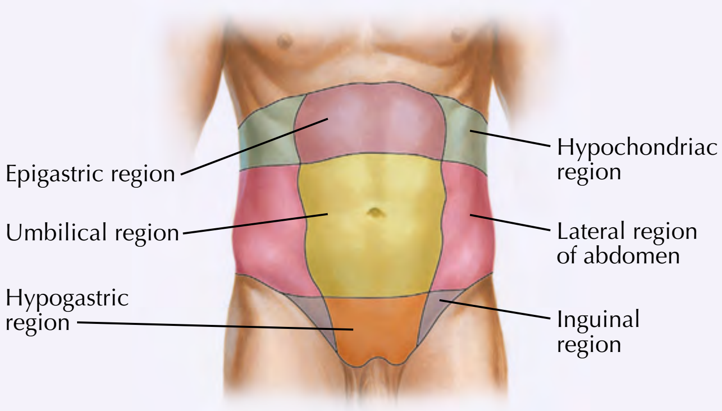
BP 82 Axial CT Image of Upper Abdomen



BP 83 Arterial Variations and Collateral Supply of Liver and Gallbladder

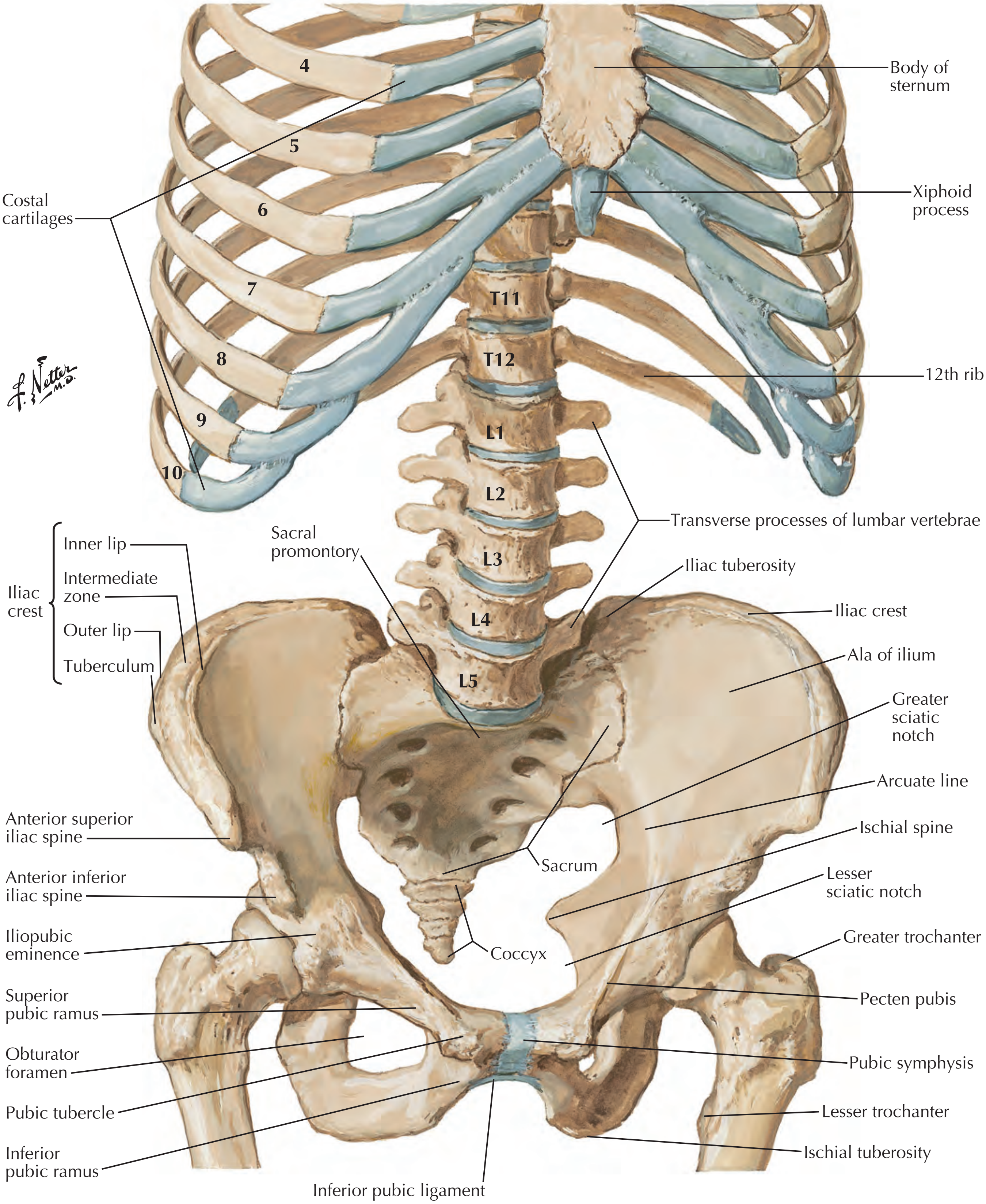
See also **Plates 188, 270**


Sternum
Body
Xiphoid process
Rectus abdominis m.
Superficial epigastric v.
Anterior superior iliac spine
Superficial circumflex iliac v.
Pubic symphysis
Pectoralis major m.
Serratus anterior m.
Tendinous intersection
External abdominal oblique m.
Linea alba
Linea semilunaris
Umbilicus
Iliac crest
Inguinal ligament
Pubic tubercle
Superficial dorsal v. of penis
Body of penis
Scrotum
Glans penis
External urethral orifice
C. Machado M.D.


Epigastric region
Umbilical region
Hypogastric region
Hypochondriac region
Lateral region of abdomen
Inguinal region

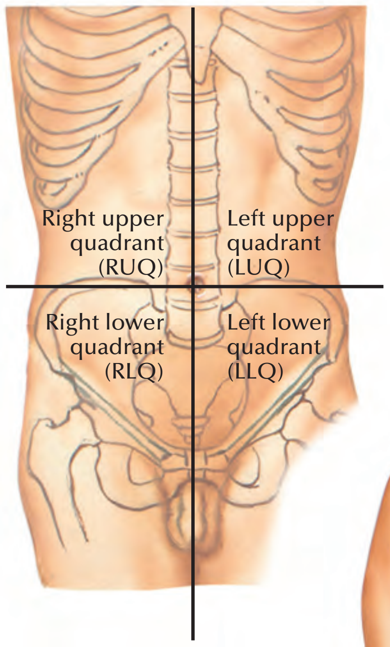
Bony Framework of Abdomen

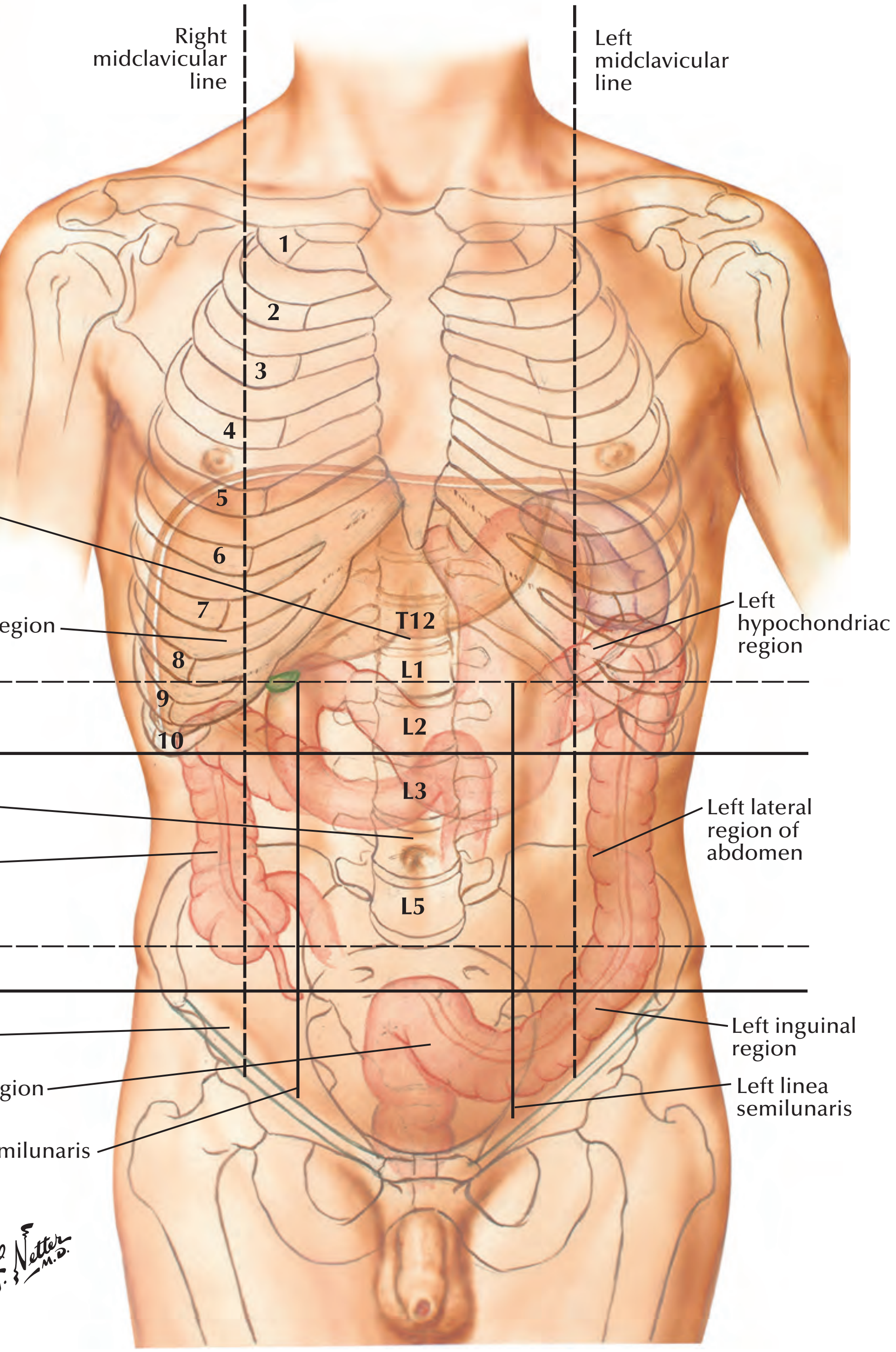
See also **Plates 203, 353**



Body of sternum
Xiphoid process
Costal cartilages
4
5
6
7
8
9
10
T11
T12
L1
L2
L3
L4
L5
12th rib
Transverse processes of lumbar vertebrae
Iliac crest
Inner lip
Intermediate zone
Outer lip
Tuberculum
Sacral promontory
Iliac tuberosity
Iliac crest
Ala of ilium
Greater sciatic notch
Arcuate line
Anterior superior iliac spine
Ischial spine
Sacrum
Anterior inferior iliac spine
Lesser sciatic notch
Iliopubic eminence
Coccyx
Greater trochanter
Superior pubic ramus
Pecten pubis
Obturator foramen
Pubic symphysis
Pubic tubercle
Lesser trochanter
Ischial tuberosity
Inferior pubic ramus
Inferior pubic ligament

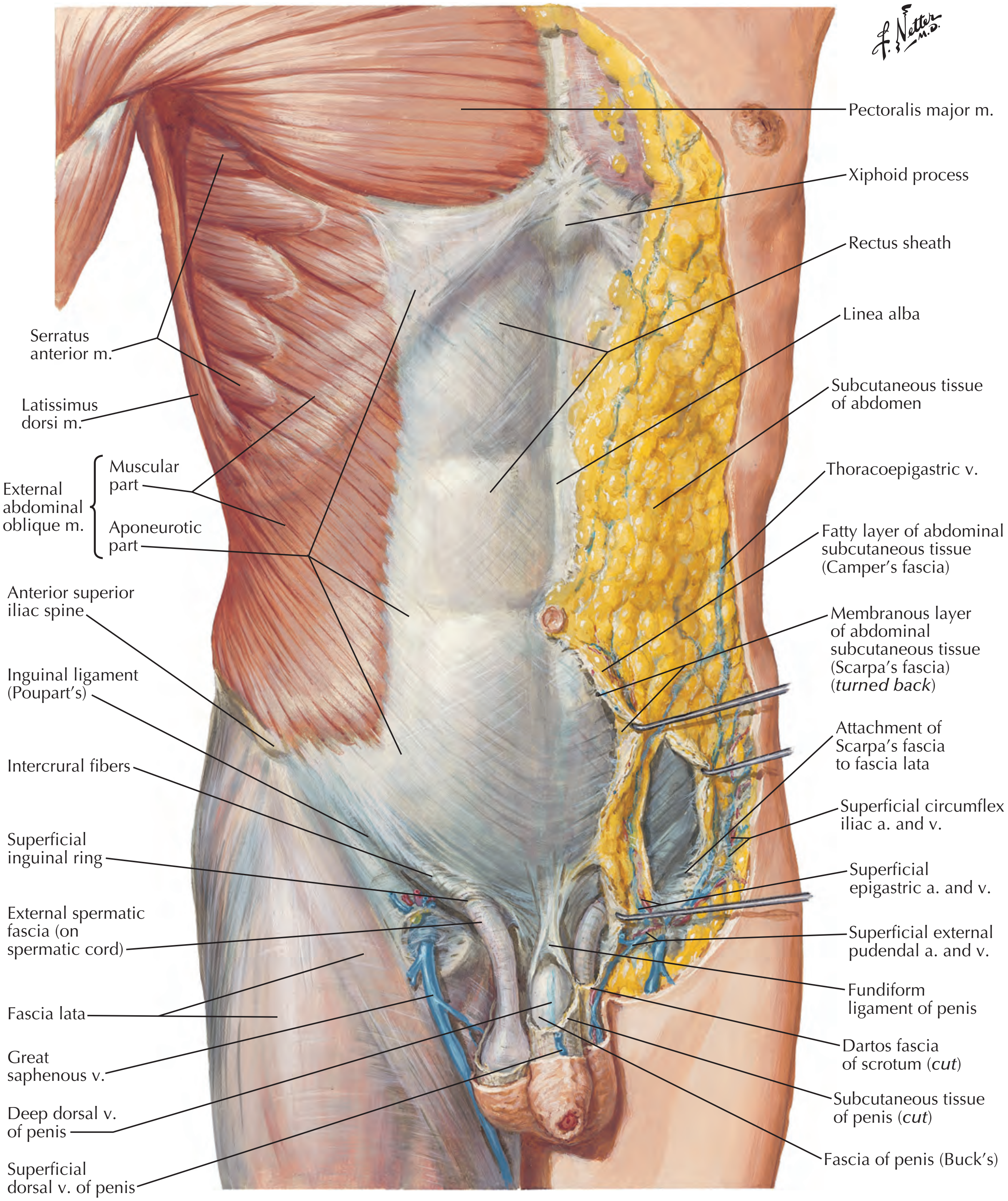
See also **Plates 217, BP 70**


Right upper quadrant (RUQ)
Left upper quadrant (LUQ)
Right lower quadrant (RLQ)
Left lower quadrant (LLQ)

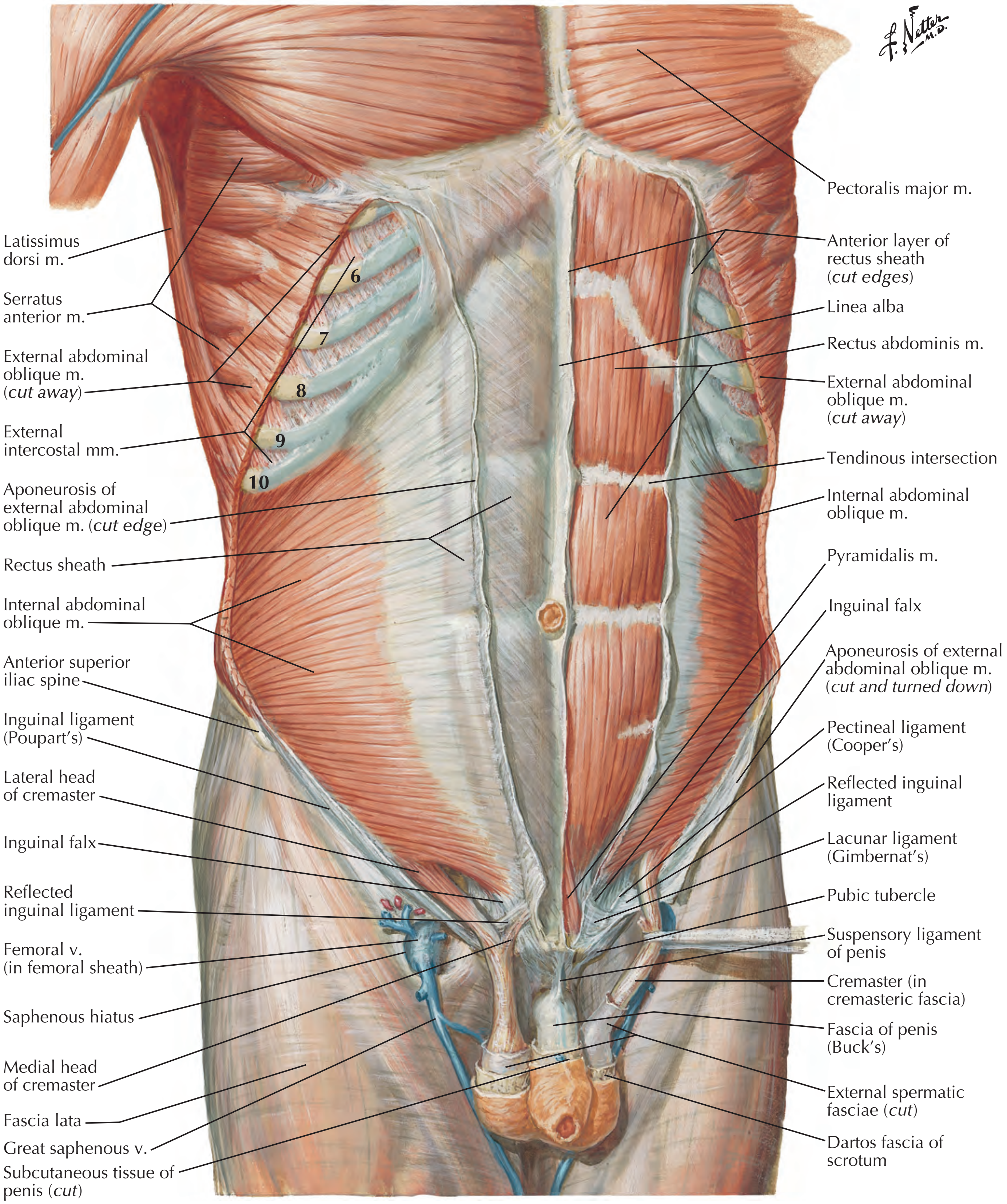

Right midclavicular line
Left midclavicular line
1
2
3
4
5
6
7
8
9
10
T12
L1
L2
L3
L5
Epigastric region
Right hypochondriac region
Left hypochondriac region
Transpyloric plane
Subcostal plane
Umbilical region
Right lateral region of abdomen
Left lateral region of abdomen
Intertubercular plane
Interspinous plane
Right inguinal region
Left inguinal region
Hypogastric region
Left linea semilunaris
Right linea semilunaris
F. Netter M.D.

Anterior Abdominal Wall: Superficial Dissection

See also **Plates 277, 352, BP 53**


Pectoralis major m.
Xiphoid process
Rectus sheath
Linea alba
Subcutaneous tissue of abdomen
Thoracoepigastric v.
Fatty layer of abdominal subcutaneous tissue (Camper's fascia)
Membranous layer of abdominal subcutaneous tissue (Scarpa's fascia) (*turned back*)
Attachment of Scarpa's fascia to fascia lata
Superficial circumflex iliac a. and v.
Superficial epigastric a. and v.
Superficial external pudendal a. and v.
Fundiform ligament of penis
Dartos fascia of scrotum (*cut*)
Subcutaneous tissue of penis (*cut*)
Fascia of penis (Buck's)
Serratus anterior m.
Latissimus dorsi m.
External abdominal oblique m.
Muscular part
Aponeurotic part
Anterior superior iliac spine
Inguinal ligament (Poupart's)
Intercrural fibers
Superficial inguinal ring
External spermatic fascia (on spermatic cord)
Fascia lata
Great saphenous v.
Deep dorsal v. of penis
Superficial dorsal v. of penis

See also **Plates 209, 210, BP 53**


Latissimus dorsi m.
Serratus anterior m.
External abdominal oblique m. (*cut away*)
External intercostal mm.
Aponeurosis of external abdominal oblique m. (*cut edge*)
Rectus sheath
Internal abdominal oblique m.
Anterior superior iliac spine
Inguinal ligament (Poupart's)
Lateral head of cremaster
Inguinal falx
Reflected inguinal ligament
Femoral v. (in femoral sheath)
Saphenous hiatus
Medial head of cremaster
Fascia lata
Great saphenous v.
Subcutaneous tissue of penis (*cut*)
6
7
8
9
10
Pectoralis major m.
Anterior layer of rectus sheath (*cut edges*)
Linea alba
Rectus abdominis m.
External abdominal oblique m. (*cut away*)
Tendinous intersection
Internal abdominal oblique m.
Pyramidalis m.
Inguinal falx
Aponeurosis of external abdominal oblique m. (*cut and turned down*)
Pectineal ligament (Cooper's)
Reflected inguinal ligament
Lacunar ligament (Gimbernat's)
Pubic tubercle
Suspensory ligament of penis
Cremaster (in cremasteric fascia)
Fascia of penis (Buck's)
External spermatic fasciae (*cut*)
Dartos fascia of scrotum
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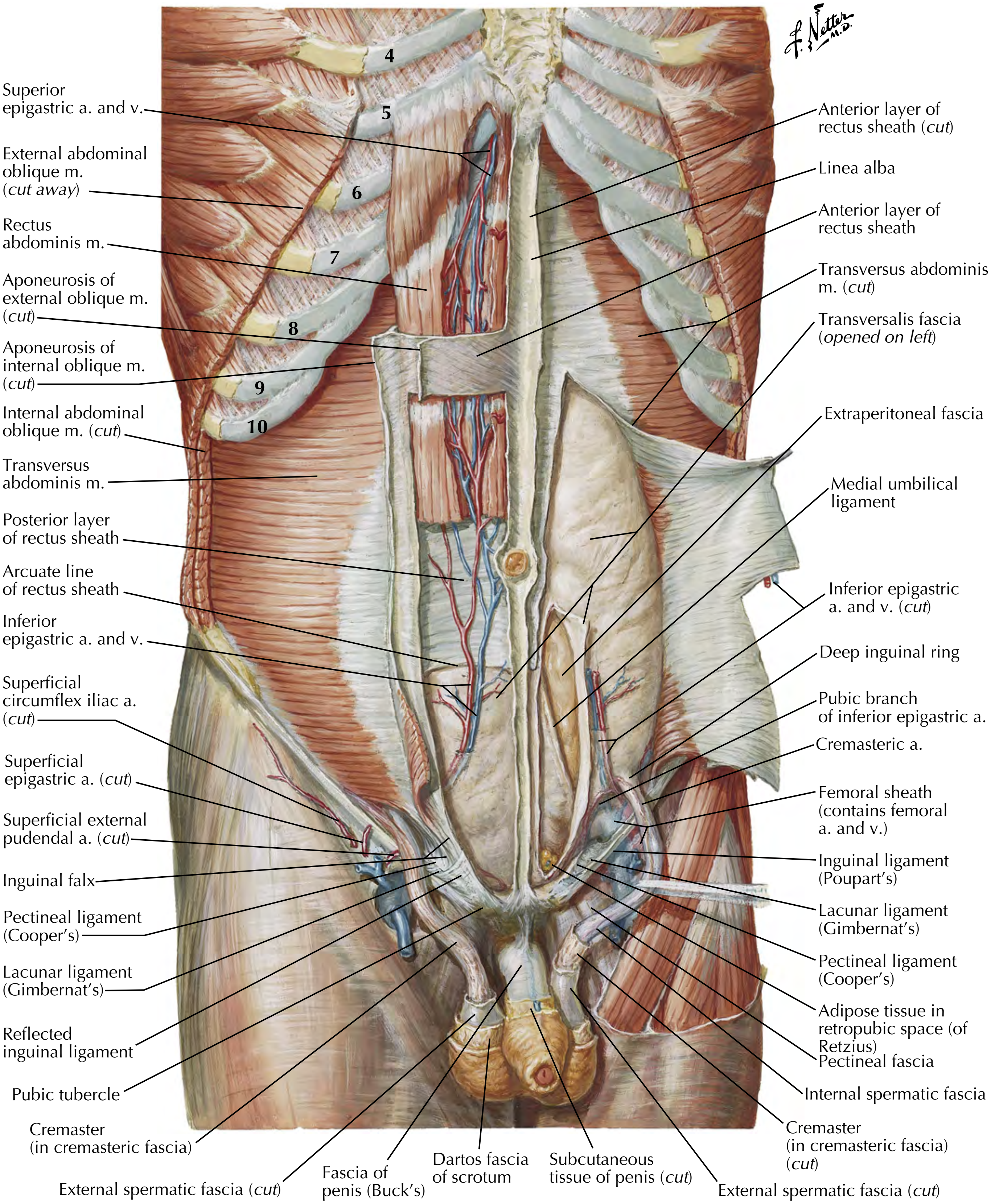
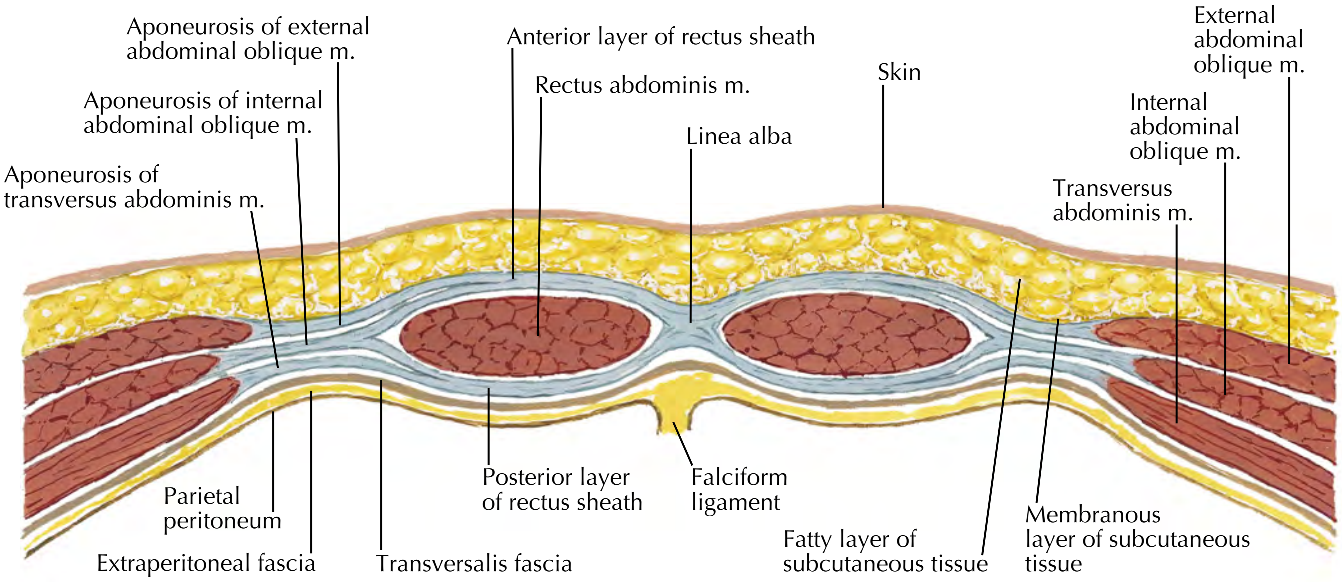
See also **Plates 210, 276, BP 54**

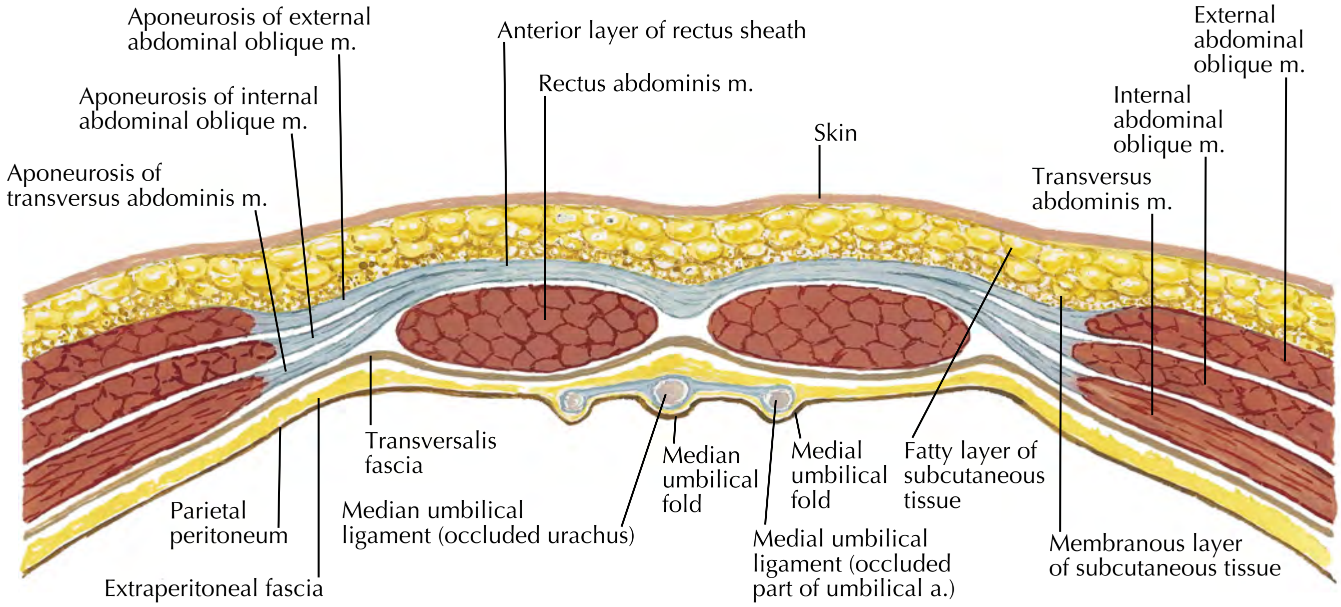

Superior epigastric a. and v.
External abdominal oblique m. (*cut away*)
Rectus abdominis m.
Aponeurosis of external oblique m. (*cut*)
Aponeurosis of internal oblique m. (*cut*)
Internal abdominal oblique m. (*cut*)
Transversus abdominis m.
Posterior layer of rectus sheath
Arcuate line of rectus sheath
Inferior epigastric a. and v.
Superficial circumflex iliac a. (*cut*)
Superficial epigastric a. (*cut*)
Superficial external pudendal a. (*cut*)
Inguinal falx
Pectineal ligament (Cooper's)
Lacunar ligament (Gimbernat's)
Reflected inguinal ligament
Pubic tubercle
Cremaster (in cremasteric fascia)
External spermatic fascia (*cut*)
Fascia of penis (Buck's)
Dartos fascia of scrotum
Subcutaneous tissue of penis (*cut*)
External spermatic fascia (*cut*)
Cremaster (in cremasteric fascia) (*cut*)
Internal spermatic fascia
Pectineal fascia
Adipose tissue in retropubic space (of Retzius)
Pectineal ligament (Cooper's)
Lacunar ligament (Gimbernat's)
Inguinal ligament (Poupart's)
Femoral sheath (contains femoral a. and v.)
Cremasteric a.
Pubic branch of inferior epigastric a.
Deep inguinal ring
Inferior epigastric a. and v. (*cut*)
Medial umbilical ligament
Extraperitoneal fascia
Transversalis fascia (*opened on left*)
Transversus abdominis m. (*cut*)
Anterior layer of rectus sheath
Linea alba
Anterior layer of rectus sheath (*cut*)
4
5
6
7
8
9
10

Section superior to arcuate line of rectus sheath


Aponeurosis of external abdominal oblique m.
Anterior layer of rectus sheath
External abdominal oblique m.
Rectus abdominis m.
Skin
Aponeurosis of internal abdominal oblique m.
Linea alba
Internal abdominal oblique m.
Aponeurosis of transversus abdominis m.
Transversus abdominis m.
Posterior layer of rectus sheath
Falciform ligament
Parietal peritoneum
Membranous layer of subcutaneous tissue
Fatty layer of subcutaneous tissue
Extraperitoneal fascia
Transversalis fascia

Aponeurosis of internal abdominal oblique muscle splits to form anterior and posterior layers of rectus sheath. Aponeurosis of external abdominal oblique muscle joins anterior layer; aponeurosis of transversus abdominis muscle joins posterior layer. Anterior and posterior layers of rectus sheath unite medially to form linea alba.

Section inferior to arcuate line of rectus sheath


Aponeurosis of external abdominal oblique m.
Anterior layer of rectus sheath
External abdominal oblique m.
Rectus abdominis m.
Aponeurosis of internal abdominal oblique m.
Internal abdominal oblique m.
Skin
Aponeurosis of transversus abdominis m.
Transversus abdominis m.
Transversalis fascia
Median umbilical fold
Medial umbilical fold
Fatty layer of subcutaneous tissue
Parietal peritoneum
Median umbilical ligament (occluded urachus)
Medial umbilical ligament (occluded part of umbilical a.)
Membranous layer of subcutaneous tissue
Extraperitoneal fascia

Aponeurosis of internal abdominal oblique muscle does not split at this level but passes completely anterior to rectus abdominis muscle and is fused there with both the aponeurosis of external abdominal oblique muscle and that of transversus abdominis muscle. Thus, the posterior layer of the rectus sheath is absent below arcuate line, leaving only transversalis fascia.

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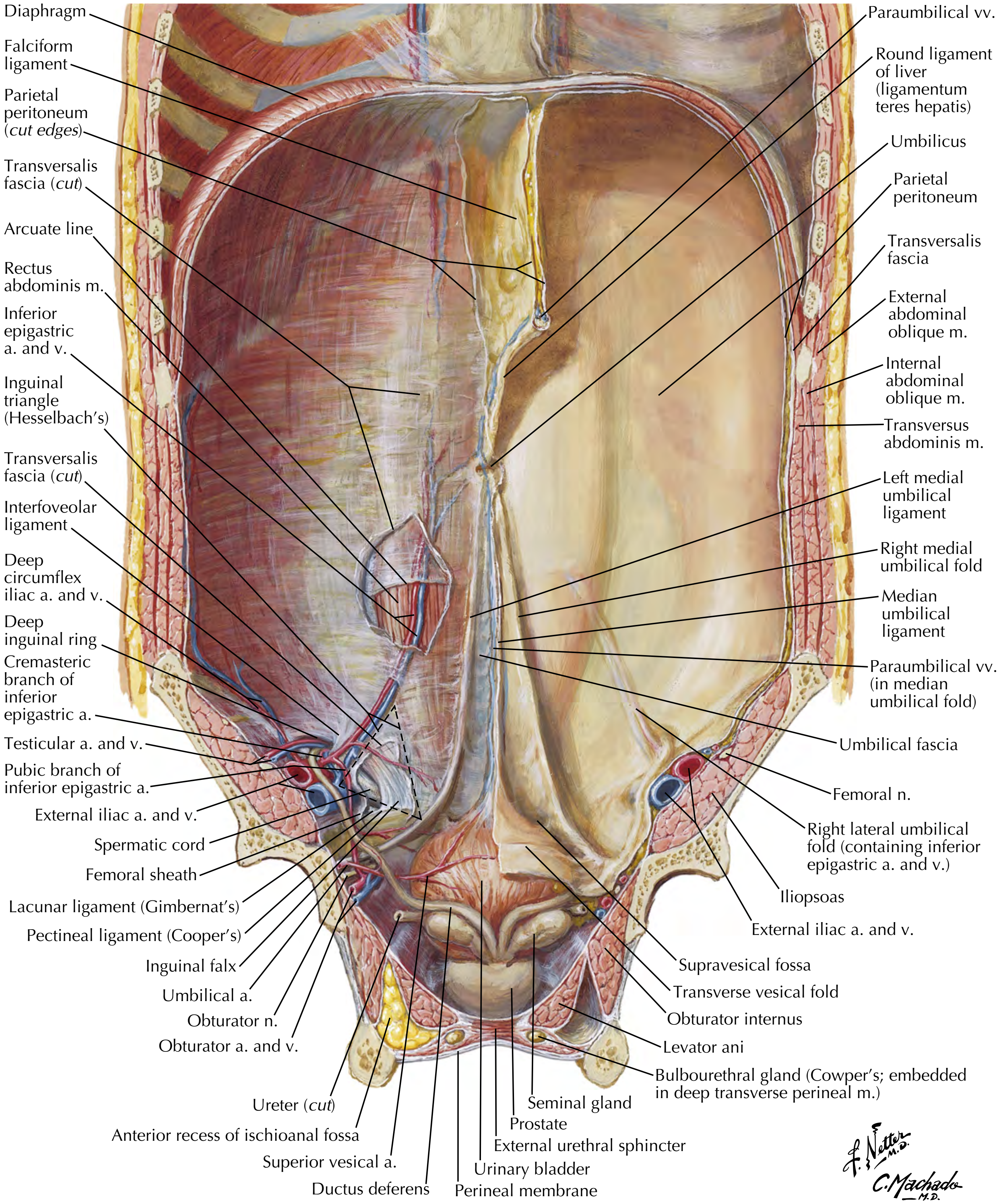
Anterior Abdominal Wall: Internal View

See also **Plate 385**


Diaphragm
Falciform ligament
Parietal peritoneum (*cut edges*)
Transversalis fascia (*cut*)
Arcuate line
Rectus abdominis m.
Inferior epigastric a. and v.
Inguinal triangle (Hesselbach's)
Transversalis fascia (*cut*)
Interfoveolar ligament
Deep circumflex iliac a. and v.
Deep inguinal ring
Cremasteric branch of inferior epigastric a.
Testicular a. and v.
Pubic branch of inferior epigastric a.
External iliac a. and v.
Spermatic cord
Femoral sheath
Lacunar ligament (Gimbernat's)
Pectineal ligament (Cooper's)
Inguinal falx
Umbilical a.
Obturator n.
Obturator a. and v.
Ureter (*cut*)
Anterior recess of ischioanal fossa
Superior vesical a.
Ductus deferens
Perineal membrane
Urinary bladder
External urethral sphincter
Prostate
Seminal gland
Bulbourethral gland (Cowper's; embedded in deep transverse perineal m.)
Levator ani
Obturator internus
Transverse vesical fold
Supravesical fossa
External iliac a. and v.
Iliopsoas
Right lateral umbilical fold (containing inferior epigastric a. and v.)
Femoral n.
Umbilical fascia
Paraumbilical vv. (in median umbilical fold)
Median umbilical ligament
Right medial umbilical fold
Left medial umbilical ligament
Transversus abdominis m.
Internal abdominal oblique m.
External abdominal oblique m.
Transversalis fascia
Parietal peritoneum
Umbilicus
Round ligament of liver (ligamentum teres hepatis)
Paraumbilical vv.
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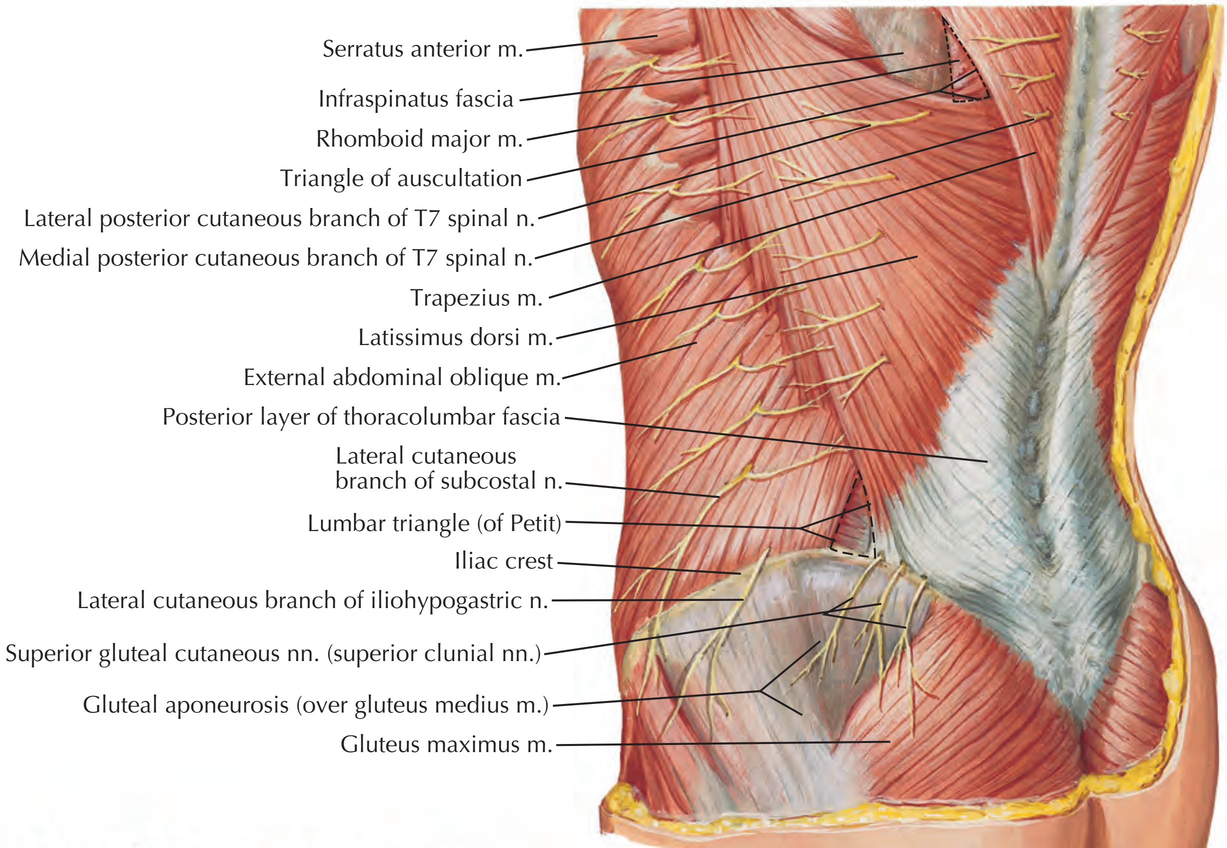
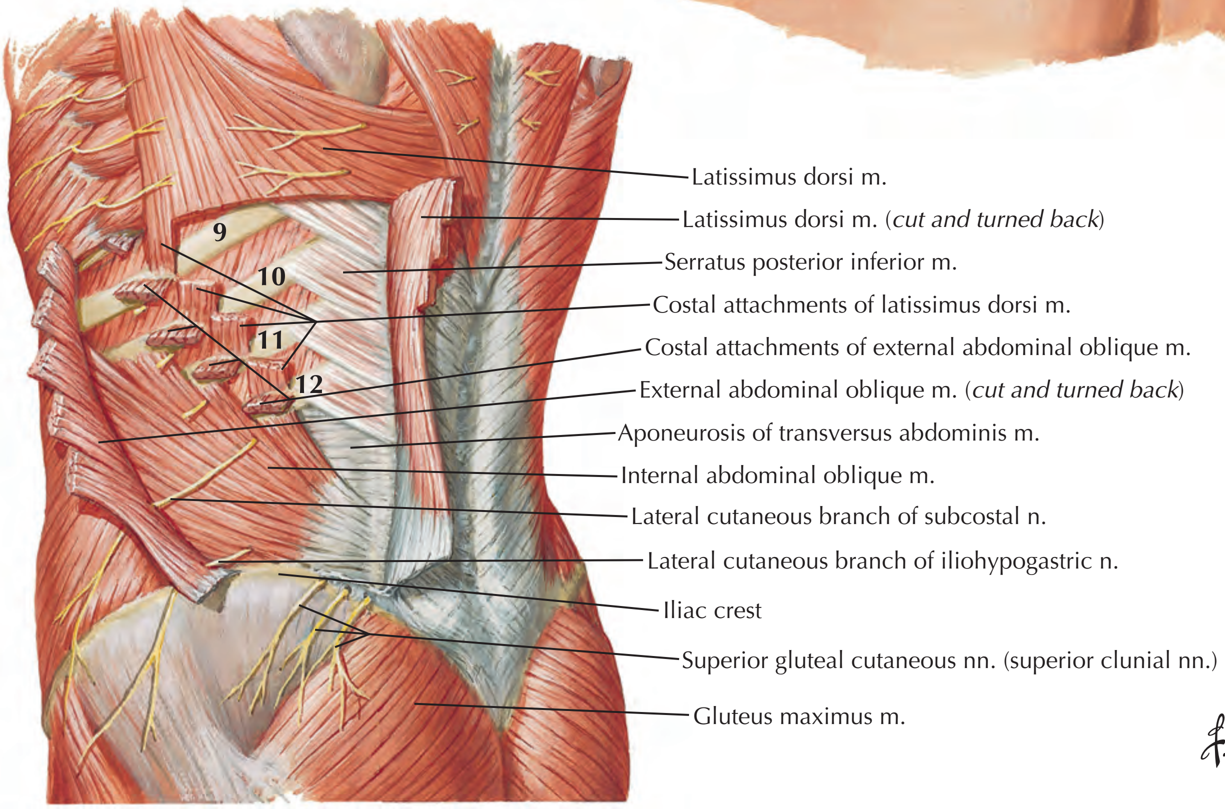
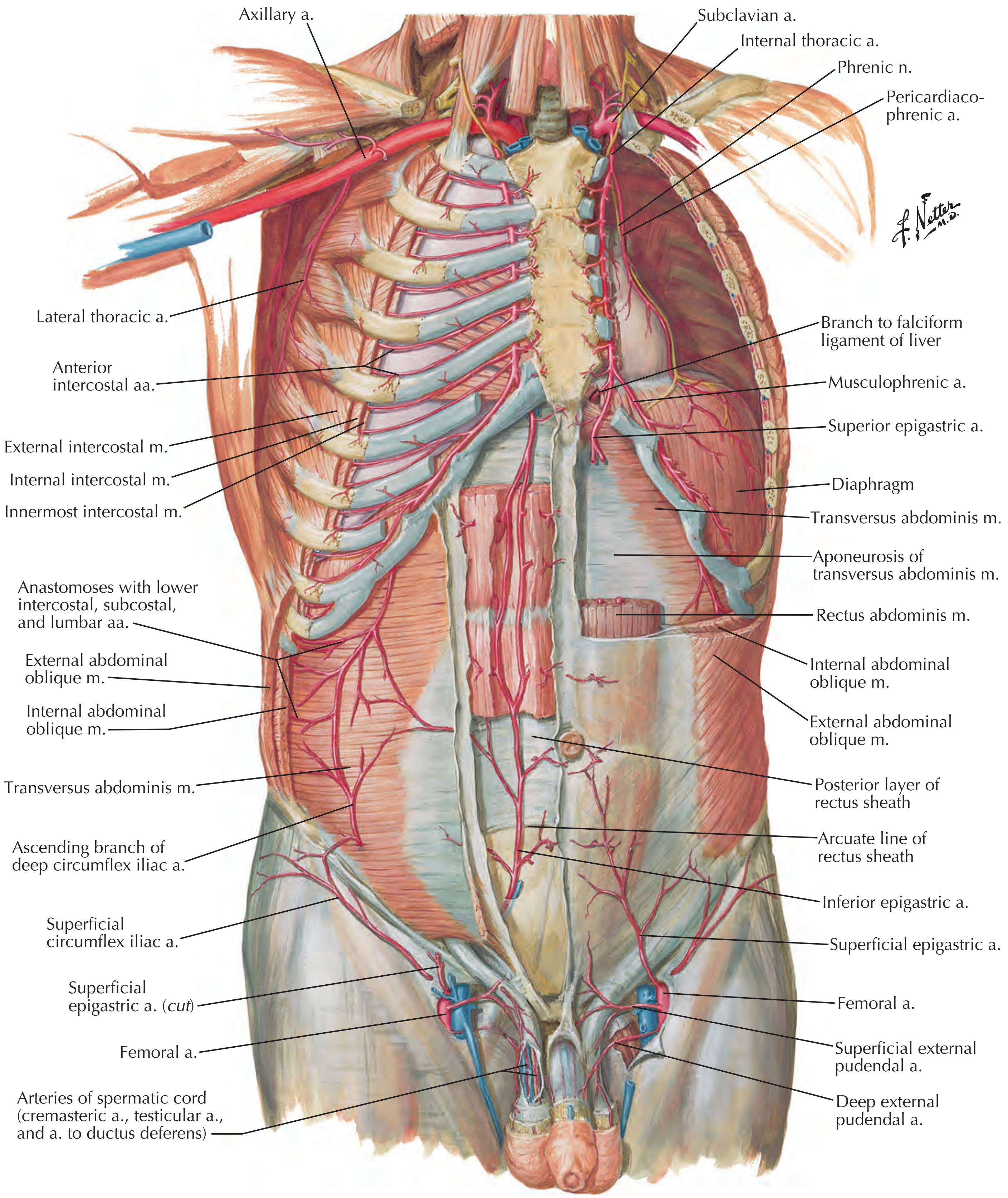
C. Machado M.D.


Serratus anterior m.
Infraspinatus fascia
Rhomboid major m.
Triangle of auscultation
Lateral posterior cutaneous branch of T7 spinal n.
Medial posterior cutaneous branch of T7 spinal n.
Trapezius m.
Latissimus dorsi m.
External abdominal oblique m.
Posterior layer of thoracolumbar fascia
Lateral cutaneous branch of subcostal n.
Lumbar triangle (of Petit)
Iliac crest
Lateral cutaneous branch of iliohypogastric n.
Superior gluteal cutaneous nn. (superior clunial nn.)
Gluteal aponeurosis (over gluteus medius m.)
Gluteus maximus m.


9
10
11
12
Latissimus dorsi m.
Latissimus dorsi m. (*cut and turned back*)
Serratus posterior inferior m.
Costal attachments of latissimus dorsi m.
Costal attachments of external abdominal oblique m.
External abdominal oblique m. (*cut and turned back*)
Aponeurosis of transversus abdominis m.
Internal abdominal oblique m.
Lateral cutaneous branch of subcostal n.
Lateral cutaneous branch of iliohypogastric n.
Iliac crest
Superior gluteal cutaneous nn. (superior clunial nn.)
Gluteus maximus m.

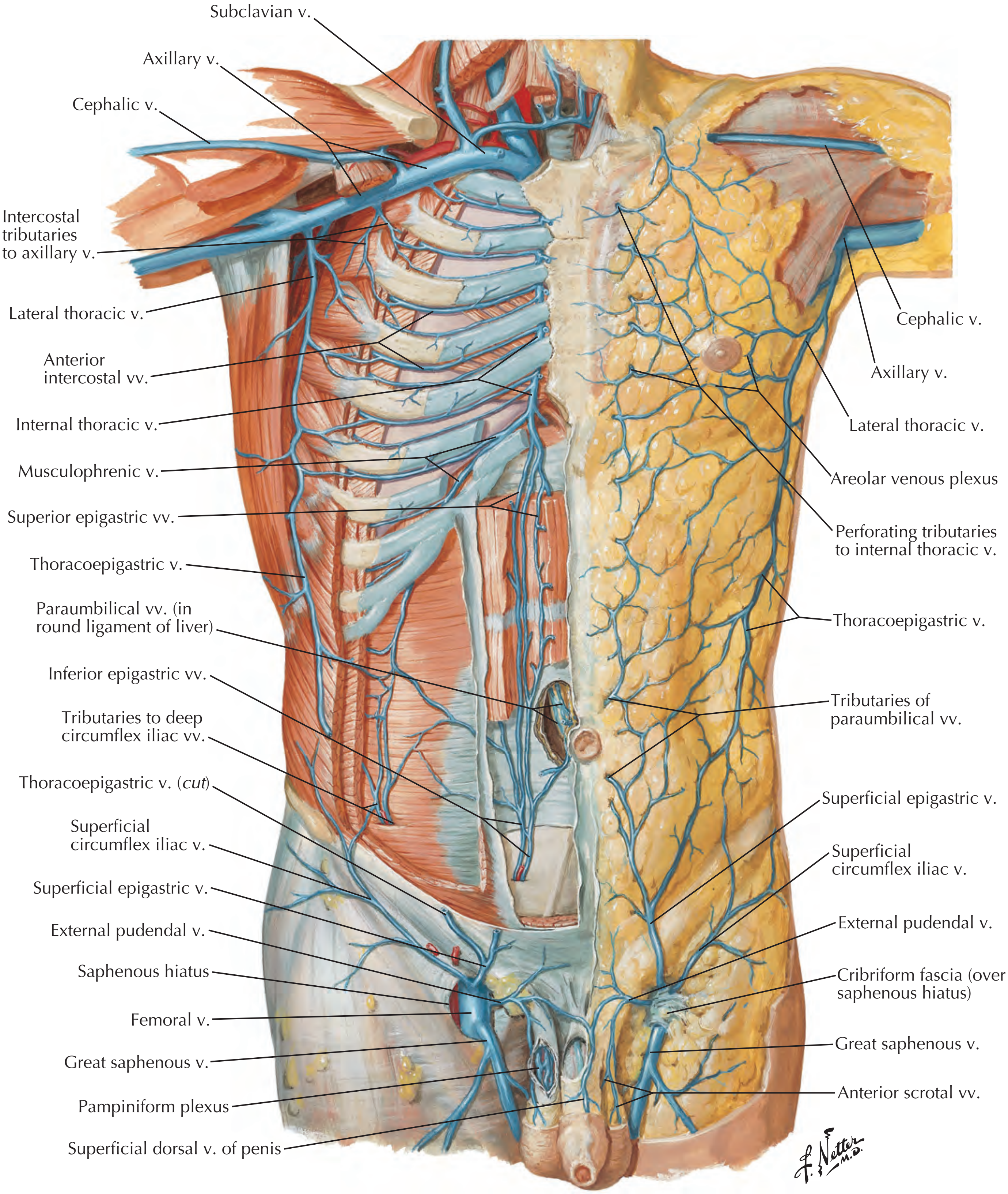
F. Netter M.D.

See also **Plate 272**

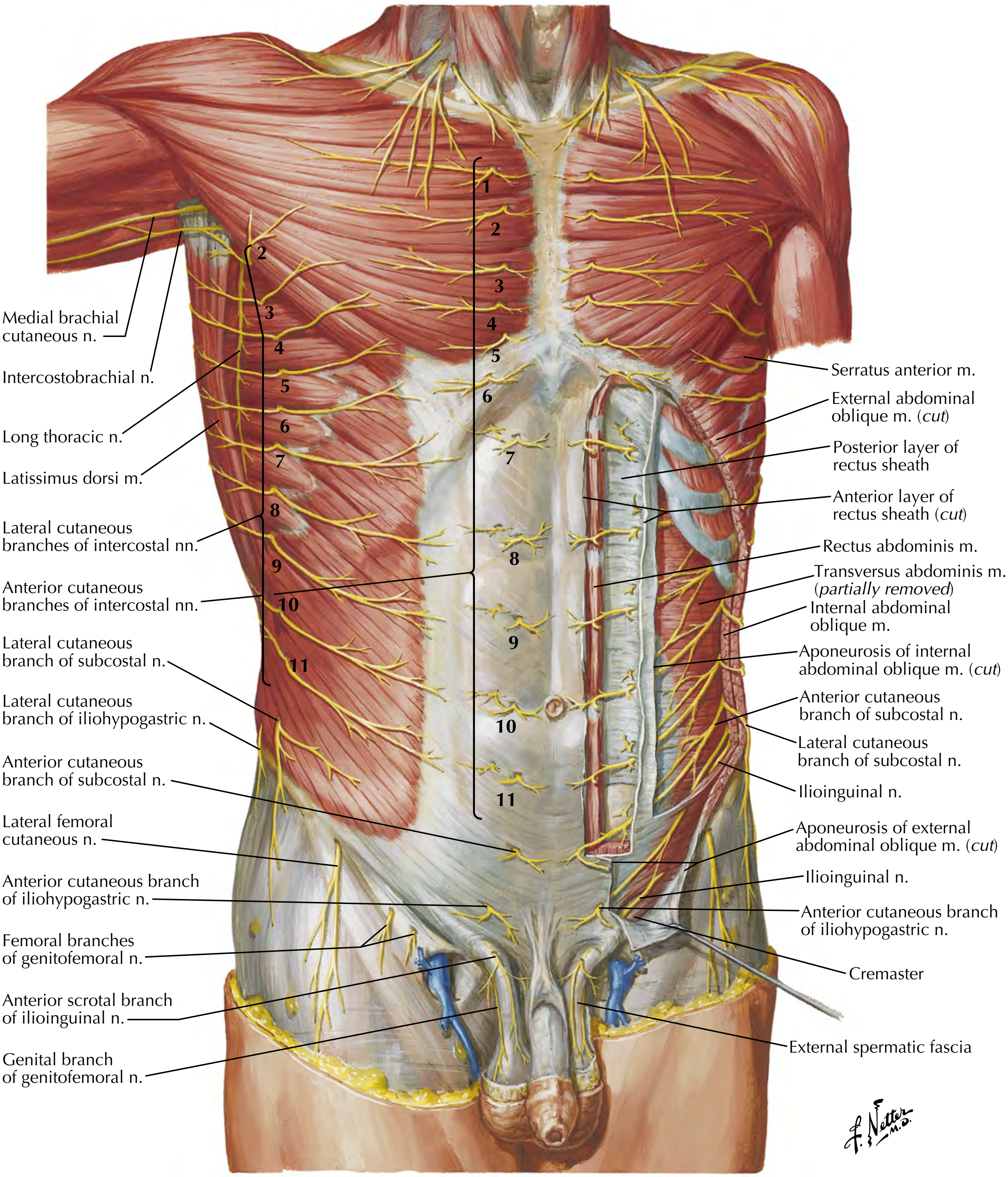

Axillary a.
Subclavian a.
Internal thoracic a.
Phrenic n.
Pericardiaco-phrenic a.
Lateral thoracic a.
Anterior intercostal aa.
External intercostal m.
Internal intercostal m.
Innermost intercostal m.
Anastomoses with lower intercostal, subcostal, and lumbar aa.
External abdominal oblique m.
Internal abdominal oblique m.
Transversus abdominis m.
Ascending branch of deep circumflex iliac a.
Superficial circumflex iliac a.
Superficial epigastric a. (*cut*)
Femoral a.
Arteries of spermatic cord (cremasteric a., testicular a., and a. to ductus deferens)
Branch to falciform ligament of liver
Musculophrenic a.
Superior epigastric a.
Diaphragm
Transversus abdominis m.
Aponeurosis of transversus abdominis m.
Rectus abdominis m.
Internal abdominal oblique m.
External abdominal oblique m.
Posterior layer of rectus sheath
Arcuate line of rectus sheath
Inferior epigastric a.
Superficial epigastric a.
Femoral a.
Superficial external pudendal a.
Deep external pudendal a.

Veins of Anterior Abdominal Wall

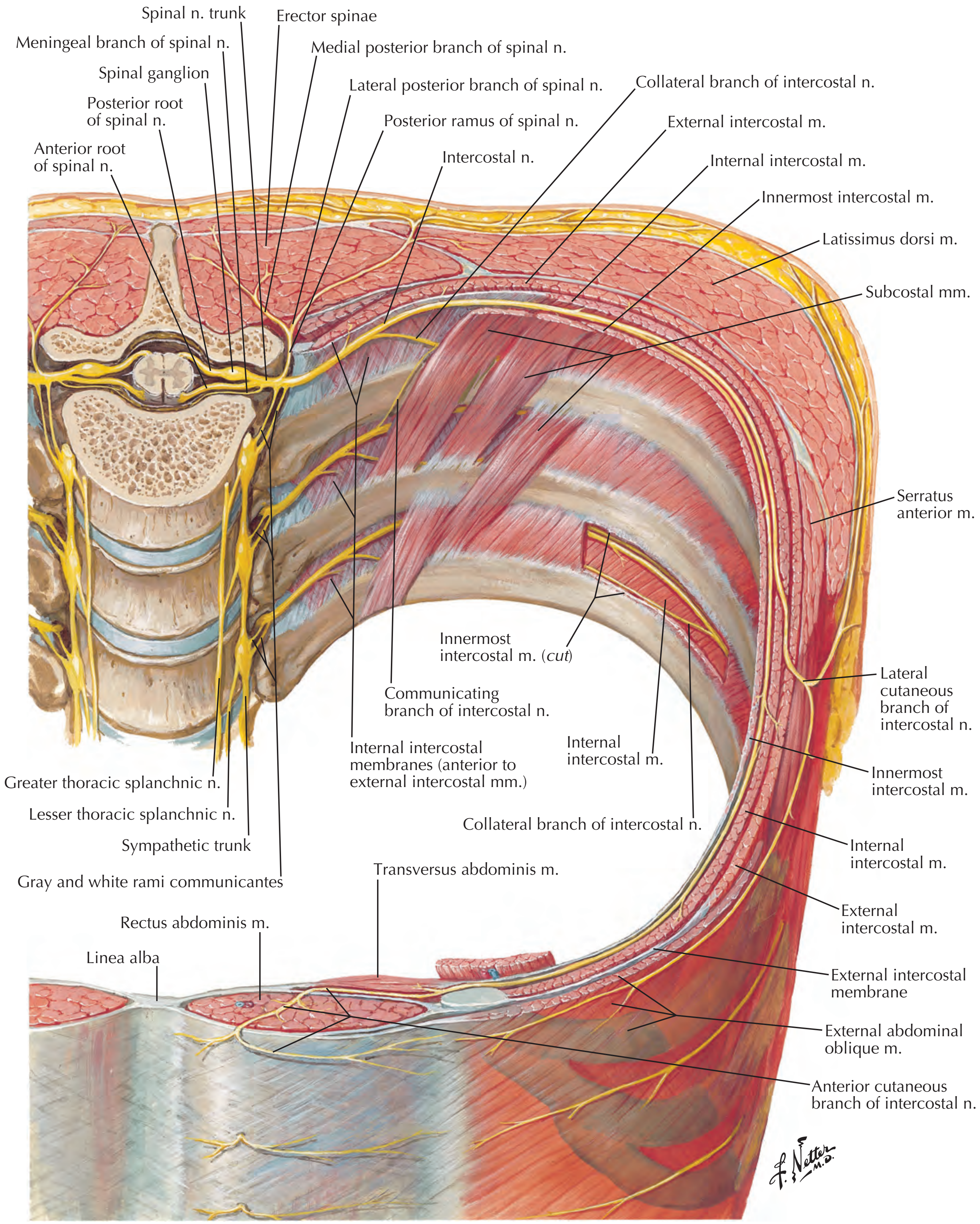
See also **Plates 270, 272**


Subclavian v.
Axillary v.
Cephalic v.
Intercostal tributaries to axillary v.
Lateral thoracic v.
Anterior intercostal vv.
Internal thoracic v.
Musculophrenic v.
Superior epigastric vv.
Thoracoepigastric v.
Paraumbilical vv. (in round ligament of liver)
Inferior epigastric vv.
Tributaries to deep circumflex iliac vv.
Thoracoepigastric v. (*cut*)
Superficial circumflex iliac v.
Superficial epigastric v.
External pudendal v.
Saphenous hiatus
Femoral v.
Great saphenous v.
Pampiniform plexus
Superficial dorsal v. of penis
Cephalic v.
Axillary v.
Lateral thoracic v.
Areolar venous plexus
Perforating tributaries to internal thoracic v.
Thoracoepigastric v.
Tributaries of paraumbilical vv.
Superficial epigastric v.
Superficial circumflex iliac v.
External pudendal v.
Cribriform fascia (over saphenous hiatus)
Great saphenous v.
Anterior scrotal vv.
F. Netter M.D.

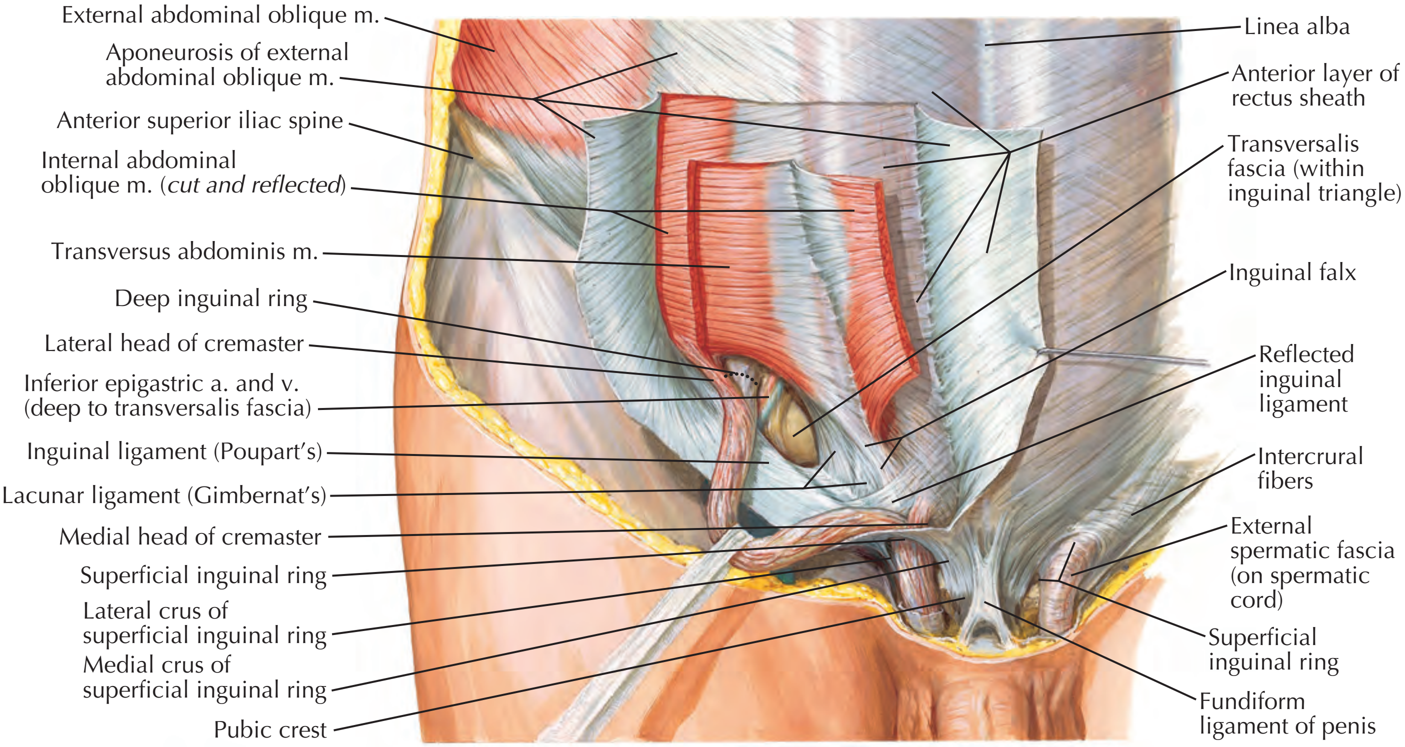
See also **Plates 188, 201, 209, 279**


Medial brachial cutaneous n.
Intercostobrachial n.
Long thoracic n.
Latissimus dorsi m.
Lateral cutaneous branches of intercostal nn.
Anterior cutaneous branches of intercostal nn.
Lateral cutaneous branch of subcostal n.
Lateral cutaneous branch of iliohypogastric n.
Anterior cutaneous branch of subcostal n.
Lateral femoral cutaneous n.
Anterior cutaneous branch of iliohypogastric n.
Femoral branches of genitofemoral n.
Anterior scrotal branch of ilioinguinal n.
Genital branch of genitofemoral n.
Serratus anterior m.
External abdominal oblique m. (*cut*)
Posterior layer of rectus sheath
Anterior layer of rectus sheath (*cut*)
Rectus abdominis m.
Transversus abdominis m. (*partially removed*)
Internal abdominal oblique m.
Aponeurosis of internal abdominal oblique m. (*cut*)
Anterior cutaneous branch of subcostal n.
Lateral cutaneous branch of subcostal n.
Ilioinguinal n.
Aponeurosis of external abdominal oblique m. (*cut*)
Ilioinguinal n.
Anterior cutaneous branch of iliohypogastric n.
Cremaster
External spermatic fascia
1
2
3
4
5
6
7
8
9
10
11
2
3
4
5
6
7
8
9
10
11
7
8
9
10
11

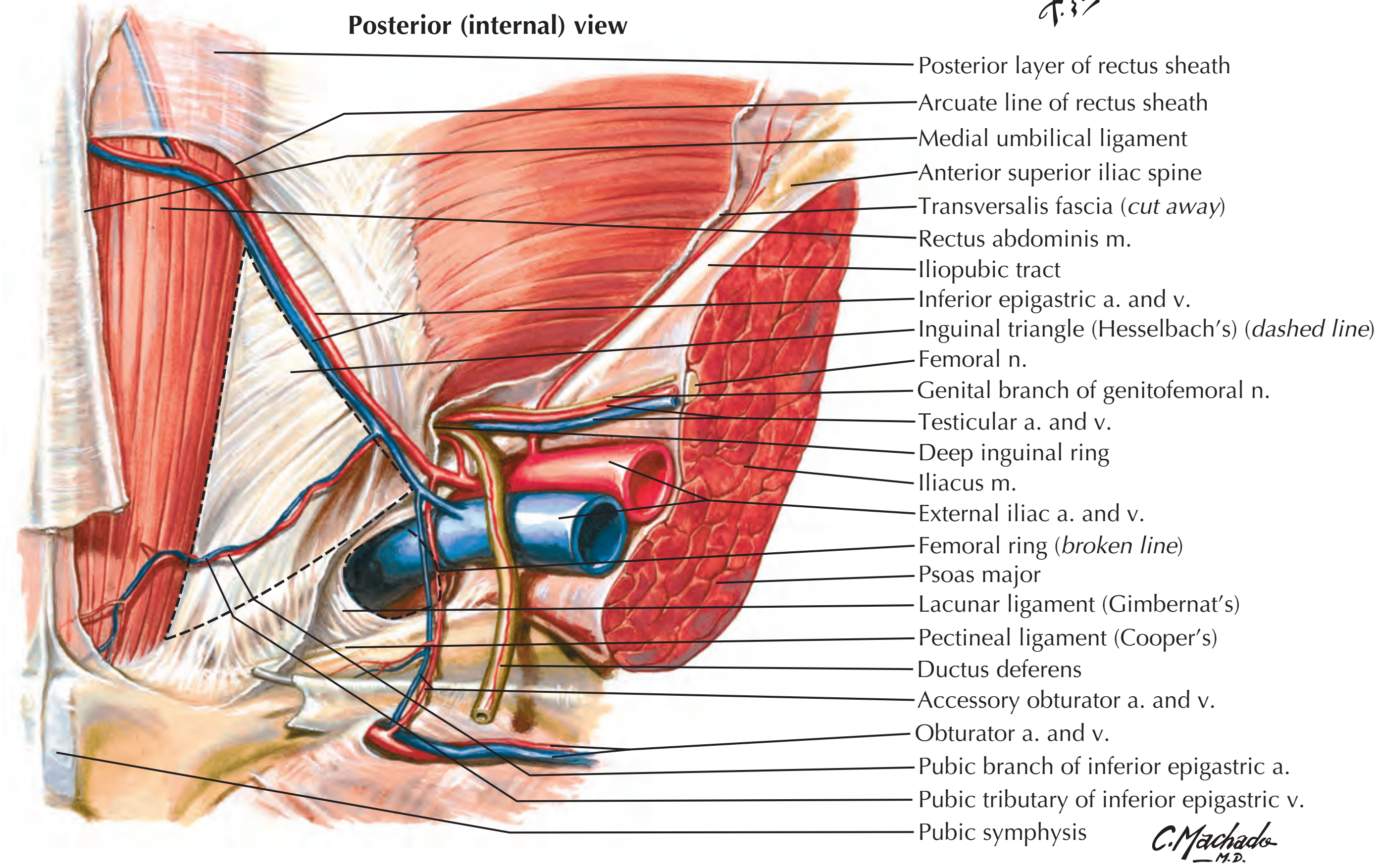
See also **Plates 272, 274**


Spinal n. trunk
Erector spinae
Meningeal branch of spinal n.
Medial posterior branch of spinal n.
Spinal ganglion
Lateral posterior branch of spinal n.
Collateral branch of intercostal n.
Posterior root of spinal n.
Posterior ramus of spinal n.
External intercostal m.
Anterior root of spinal n.
Intercostal n.
Internal intercostal m.
Innermost intercostal m.
Latissimus dorsi m.
Subcostal mm.
Serratus anterior m.
Innermost intercostal m. (*cut*)
Lateral cutaneous branch of intercostal n.
Communicating branch of intercostal n.
Internal intercostal membranes (anterior to external intercostal mm.)
Internal intercostal m.
Innermost intercostal m.
Greater thoracic splanchnic n.
Lesser thoracic splanchnic n.
Collateral branch of intercostal n.
Internal intercostal m.
Sympathetic trunk
Transversus abdominis m.
Gray and white rami communicantes
External intercostal m.
Rectus abdominis m.
Linea alba
External intercostal membrane
External abdominal oblique m.
Anterior cutaneous branch of intercostal n.
F. Netter M.D.

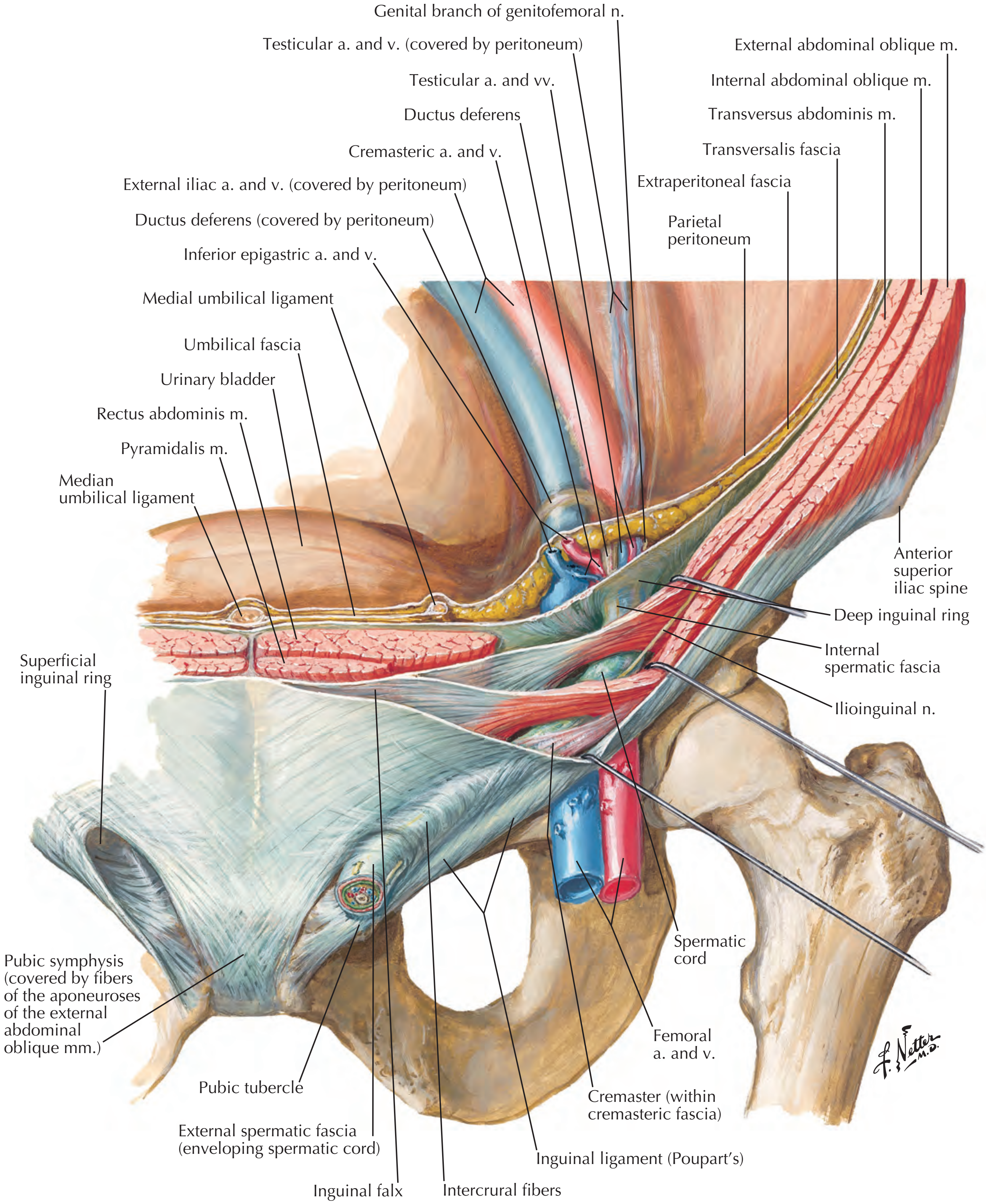
Anterior view


External abdominal oblique m.
Aponeurosis of external abdominal oblique m.
Anterior superior iliac spine
Internal abdominal oblique m. (*cut and reflected*)
Transversus abdominis m.
Deep inguinal ring
Lateral head of cremaster
Inferior epigastric a. and v. (deep to transversalis fascia)
Inguinal ligament (Poupart's)
Lacunar ligament (Gimbernat's)
Medial head of cremaster
Superficial inguinal ring
Lateral crus of superficial inguinal ring
Medial crus of superficial inguinal ring
Pubic crest
Linea alba
Anterior layer of rectus sheath
Transversalis fascia (within inguinal triangle)
Inguinal falx
Reflected inguinal ligament
Intercrural fibers
External spermatic fascia (on spermatic cord)
Superficial inguinal ring
Fundiform ligament of penis

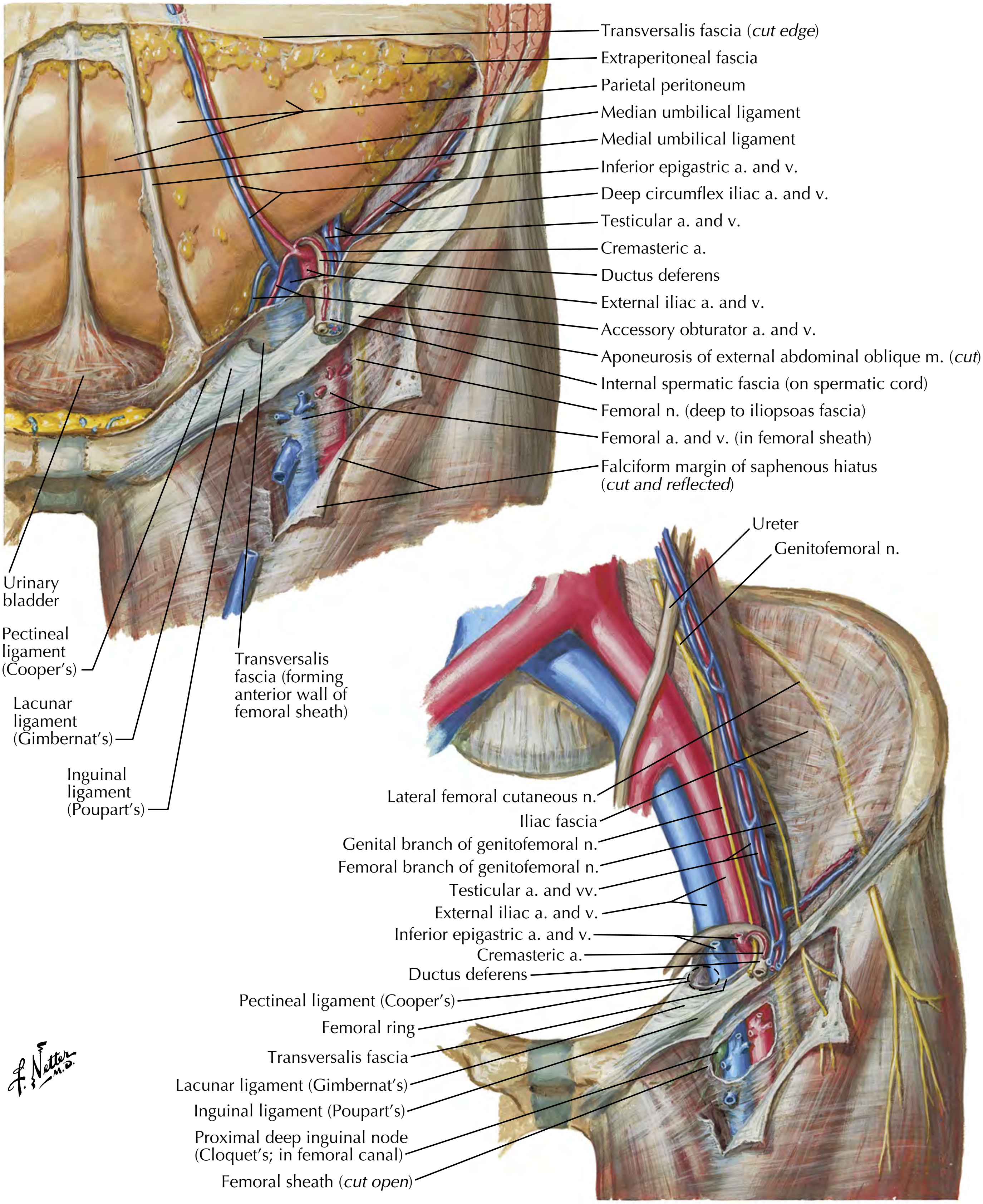
Posterior (internal) view

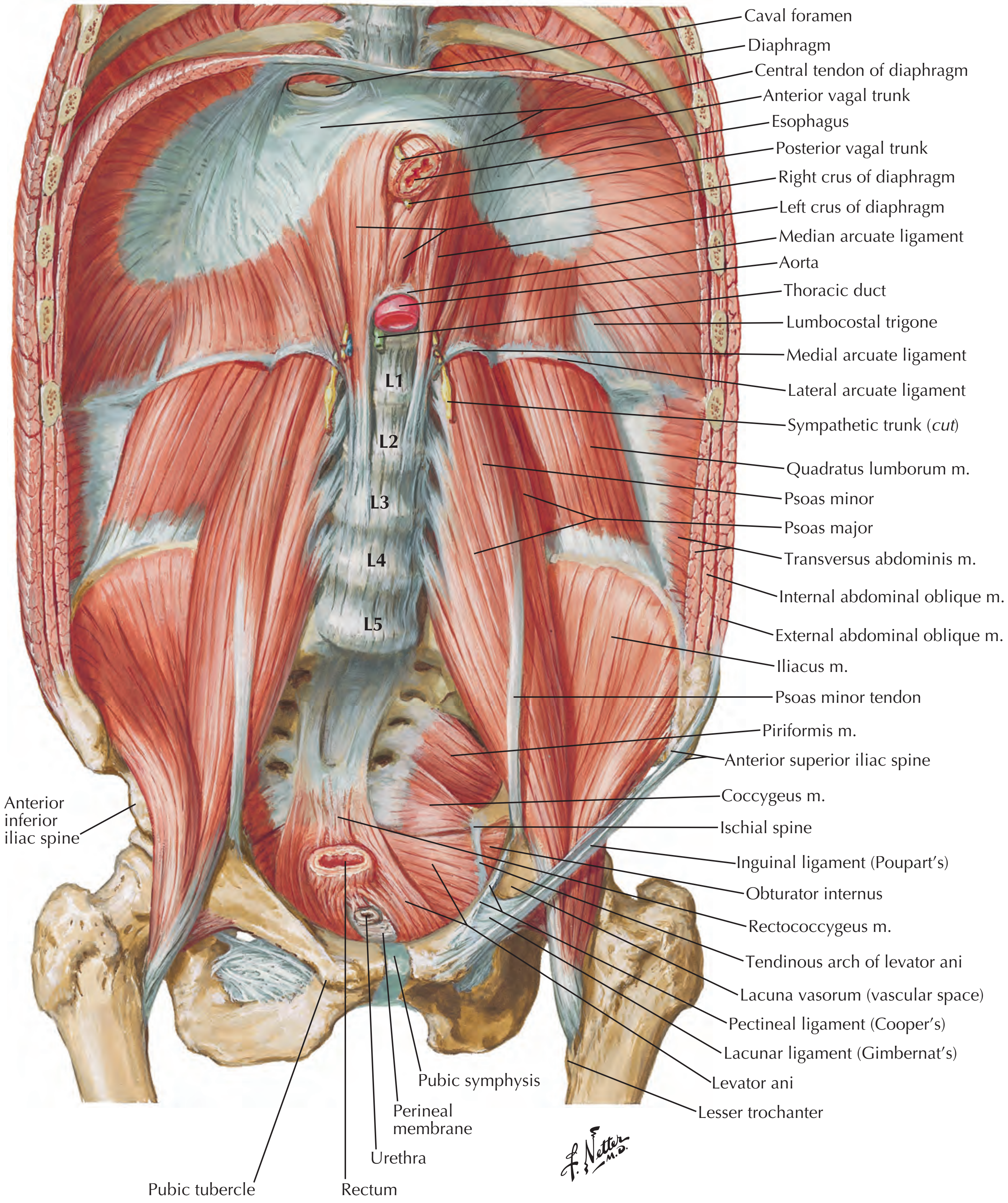

Posterior layer of rectus sheath
Arcuate line of rectus sheath
Medial umbilical ligament
Anterior superior iliac spine
Transversalis fascia (*cut away*)
Rectus abdominis m.
Iliopubic tract
Inferior epigastric a. and v.
Inguinal triangle (Hesselbach's) (*dashed line*)
Femoral n.
Genital branch of genitofemoral n.
Testicular a. and v.
Deep inguinal ring
Iliacus m.
External iliac a. and v.
Femoral ring (*broken line*)
Psoas major
Lacunar ligament (Gimbernat's)
Pectineal ligament (Cooper's)
Ductus deferens
Accessory obturator a. and v.
Obturator a. and v.
Pubic branch of inferior epigastric a.
Pubic tributary of inferior epigastric v.
Pubic symphysis

See also **Plates 270, 278, BP 54**


Genital branch of genitofemoral n.
Testicular a. and v. (covered by peritoneum)
Testicular a. and vv.
Ductus deferens
Cremasteric a. and v.
External iliac a. and v. (covered by peritoneum)
Ductus deferens (covered by peritoneum)
Inferior epigastric a. and v.
Medial umbilical ligament
Umbilical fascia
Urinary bladder
Rectus abdominis m.
Pyramidalis m.
Median umbilical ligament
Superficial inguinal ring
Pubic symphysis (covered by fibers of the aponeuroses of the external abdominal oblique mm.)
Pubic tubercle
External spermatic fascia (enveloping spermatic cord)
Inguinal falx
Intercrural fibers
Inguinal ligament (Poupart's)
Cremaster (within cremasteric fascia)
Femoral a. and v.
Spermatic cord
Ilioinguinal n.
Internal spermatic fascia
Deep inguinal ring
Anterior superior iliac spine
External abdominal oblique m.
Internal abdominal oblique m.
Transversus abdominis m.
Transversalis fascia
Extraperitoneal fascia
Parietal peritoneum
F. Netter M.D.

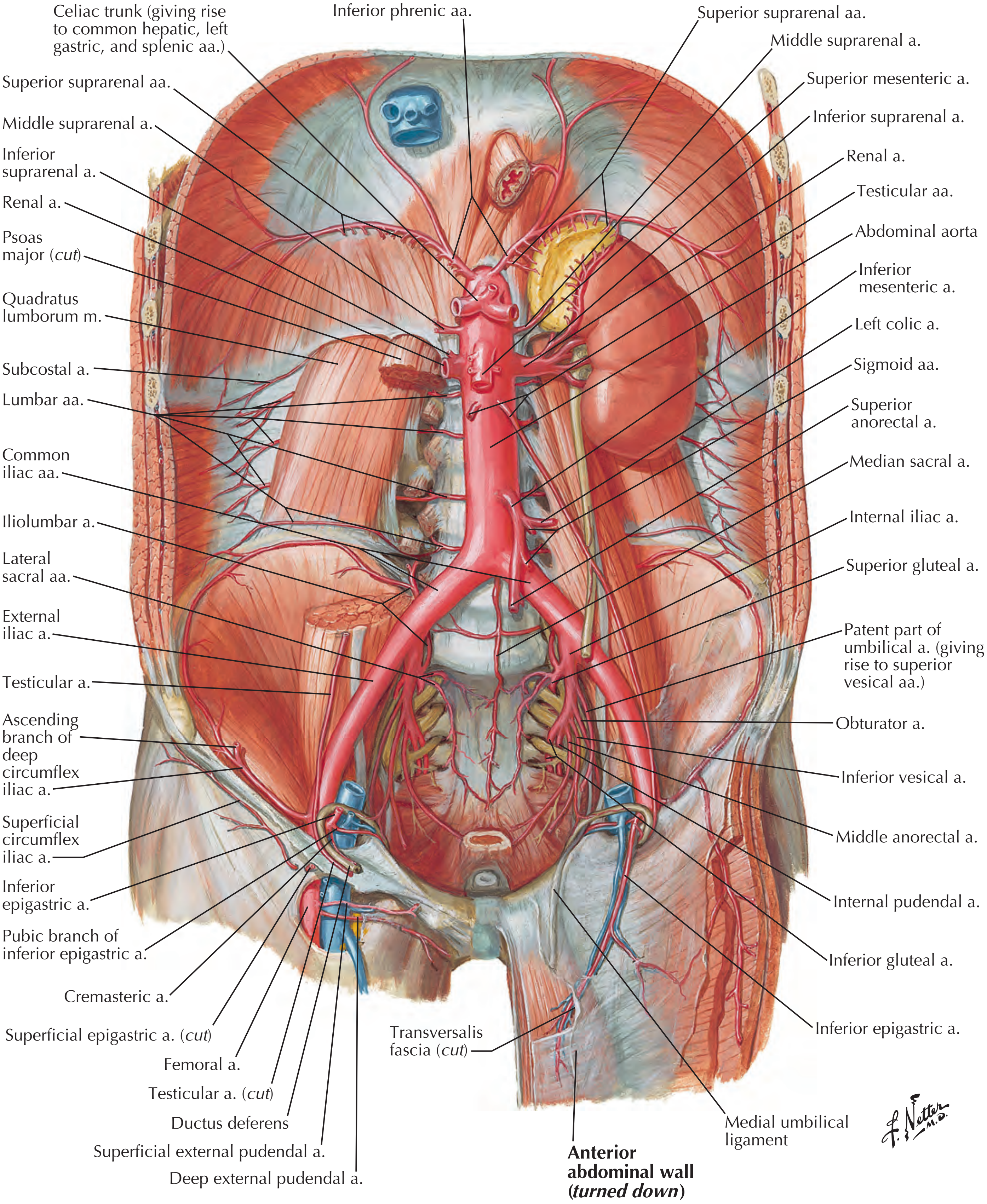
Femoral Sheath and Inguinal Canal


Transversalis fascia (*cut edge*)
Extraperitoneal fascia
Parietal peritoneum
Median umbilical ligament
Medial umbilical ligament
Inferior epigastric a. and v.
Deep circumflex iliac a. and v.
Testicular a. and v.
Cremasteric a.
Ductus deferens
External iliac a. and v.
Accessory obturator a. and v.
Aponeurosis of external abdominal oblique m. (*cut*)
Internal spermatic fascia (on spermatic cord)
Femoral n. (deep to iliopsoas fascia)
Femoral a. and v. (in femoral sheath)
Falciform margin of saphenous hiatus (*cut and reflected*)
Urinary bladder
Pectineal ligament (Cooper's)
Lacunar ligament (Gimbernat's)
Inguinal ligament (Poupart's)
Transversalis fascia (forming anterior wall of femoral sheath)
Ureter
Genitofemoral n.
Lateral femoral cutaneous n.
Iliac fascia
Genital branch of genitofemoral n.
Femoral branch of genitofemoral n.
Testicular a. and vv.
External iliac a. and v.
Inferior epigastric a. and v.
Cremasteric a.
Ductus deferens
Pectineal ligament (Cooper's)
Femoral ring
Transversalis fascia
Lacunar ligament (Gimbernat's)
Inguinal ligament (Poupart's)
Proximal deep inguinal node (Cloquet's; in femoral canal)
Femoral sheath (*cut open*)
F. Netter M.D.


Caval foramen
Diaphragm
Central tendon of diaphragm
Anterior vagal trunk
Esophagus
Posterior vagal trunk
Right crus of diaphragm
Left crus of diaphragm
Median arcuate ligament
Aorta
Thoracic duct
Lumbocostal trigone
Medial arcuate ligament
Lateral arcuate ligament
Sympathetic trunk (*cut*)
Quadratus lumborum m.
Psoas minor
Psoas major
Transversus abdominis m.
Internal abdominal oblique m.
External abdominal oblique m.
Iliacus m.
Psoas minor tendon
Piriformis m.
Anterior superior iliac spine
Coccygeus m.
Ischial spine
Inguinal ligament (Poupart's)
Obturator internus
Rectococcygeus m.
Tendinous arch of levator ani
Lacuna vasorum (vascular space)
Pectineal ligament (Cooper's)
Lacunar ligament (Gimbernat's)
Levator ani
Lesser trochanter
L1
L2
L3
L4
L5
Anterior inferior iliac spine
Pubic symphysis
Perineal membrane
Urethra
Pubic tubercle
Rectum
F. Netter M.D.

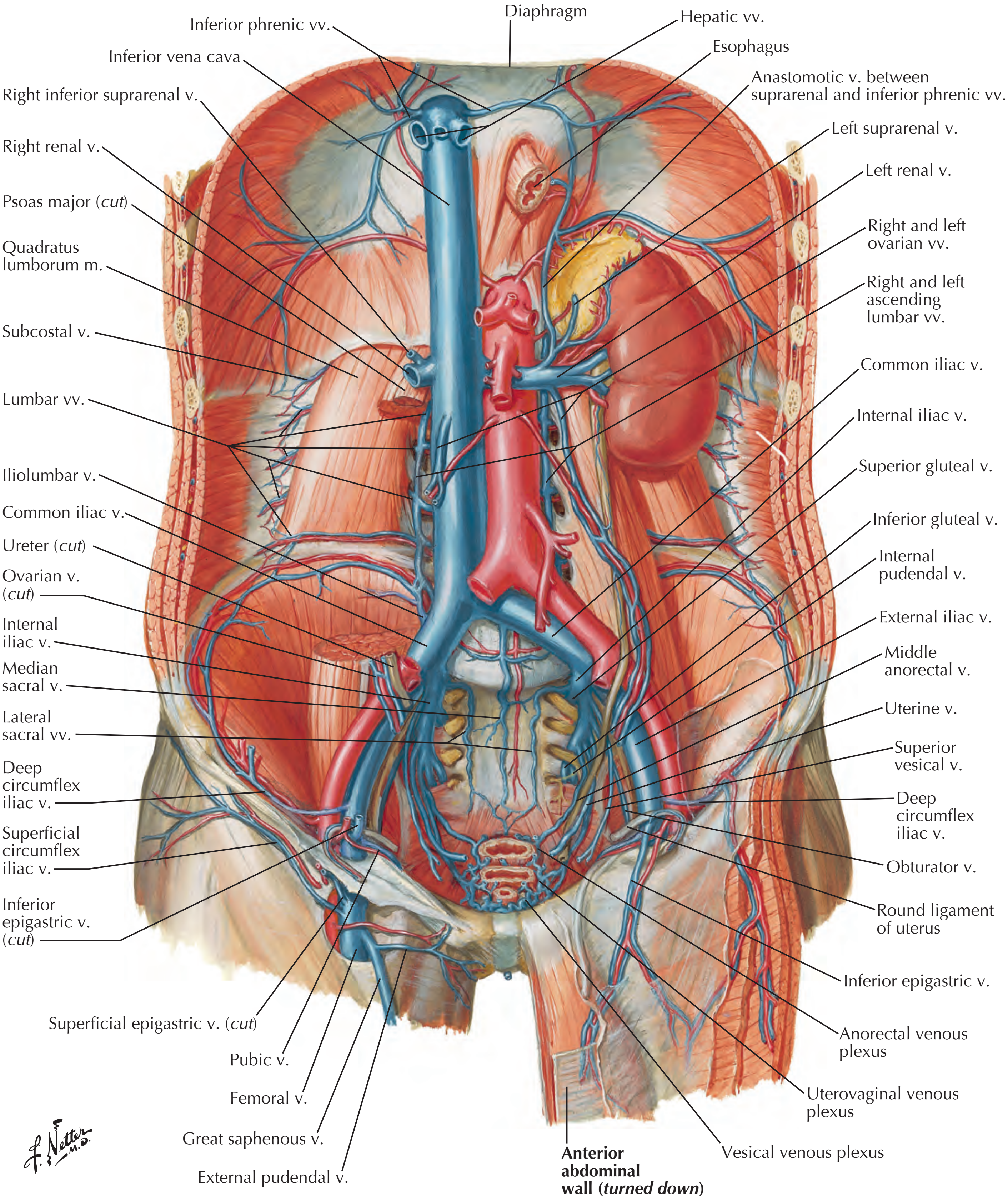
Arteries of Posterior Abdominal Wall

See also **Plates 216, 403, 404**


Celiac trunk (giving rise to common hepatic, left gastric, and splenic aa.)
Inferior phrenic aa.
Superior suprarenal aa.
Middle suprarenal a.
Superior mesenteric a.
Inferior suprarenal a.
Renal a.
Testicular aa.
Abdominal aorta
Inferior mesenteric a.
Left colic a.
Sigmoid aa.
Superior anorectal a.
Median sacral a.
Internal iliac a.
Superior gluteal a.
Patent part of umbilical a. (giving rise to superior vesical aa.)
Obturator a.
Inferior vesical a.
Middle anorectal a.
Internal pudendal a.
Inferior gluteal a.
Inferior epigastric a.
Medial umbilical ligament
Anterior abdominal wall (*turned down*)
Transversalis fascia (*cut*)
Superior suprarenal aa.
Middle suprarenal a.
Inferior suprarenal a.
Renal a.
Psoas major (*cut*)
Quadratus lumborum m.
Subcostal a.
Lumbar aa.
Common iliac aa.
Iliolumbar a.
Lateral sacral aa.
External iliac a.
Testicular a.
Ascending branch of deep circumflex iliac a.
Superficial circumflex iliac a.
Inferior epigastric a.
Pubic branch of inferior epigastric a.
Cremasteric a.
Superficial epigastric a. (*cut*)
Femoral a.
Testicular a. (*cut*)
Ductus deferens
Superficial external pudendal a.
Deep external pudendal a.

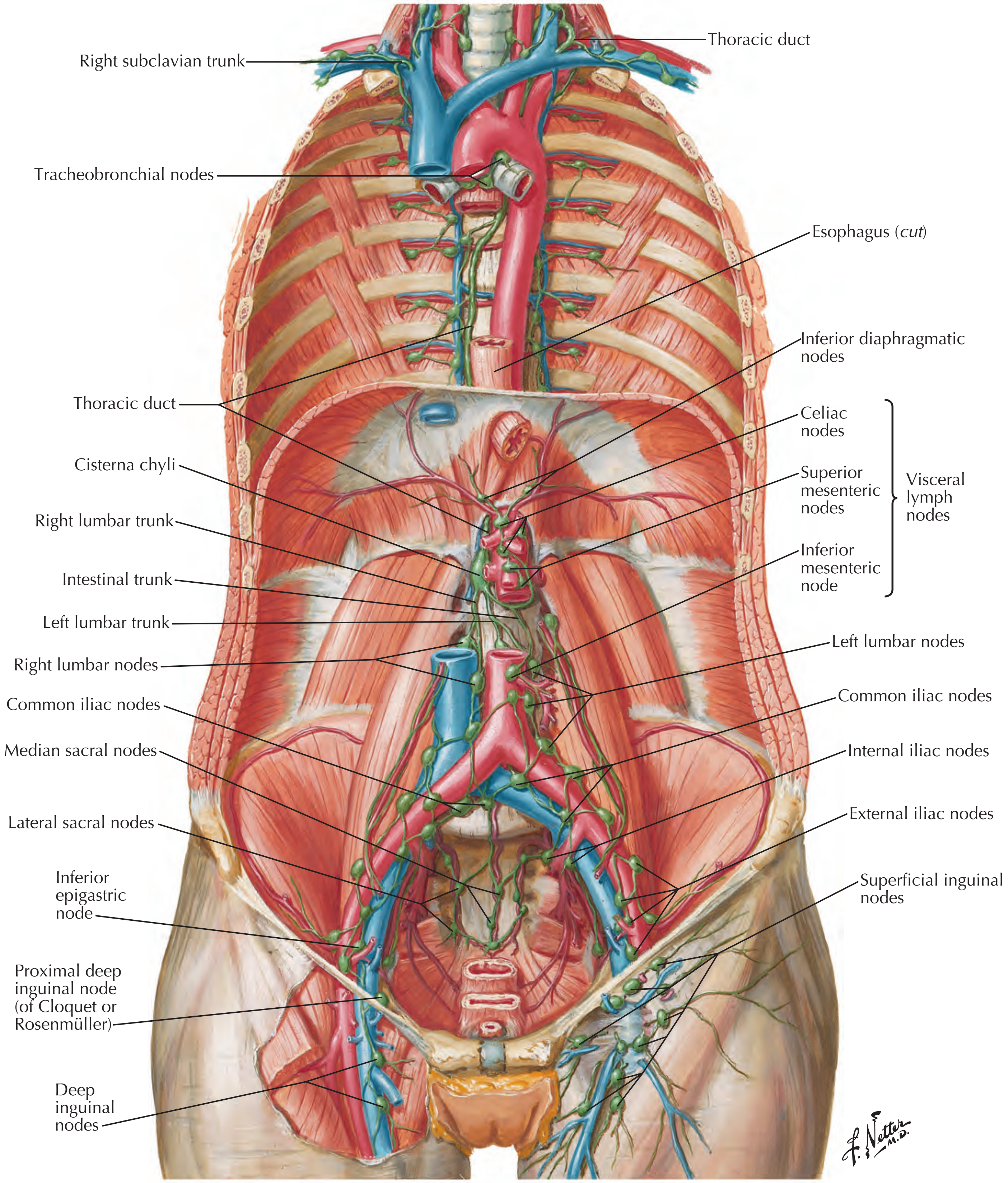
Veins of Posterior Abdominal Wall

See also Plates 402, 403

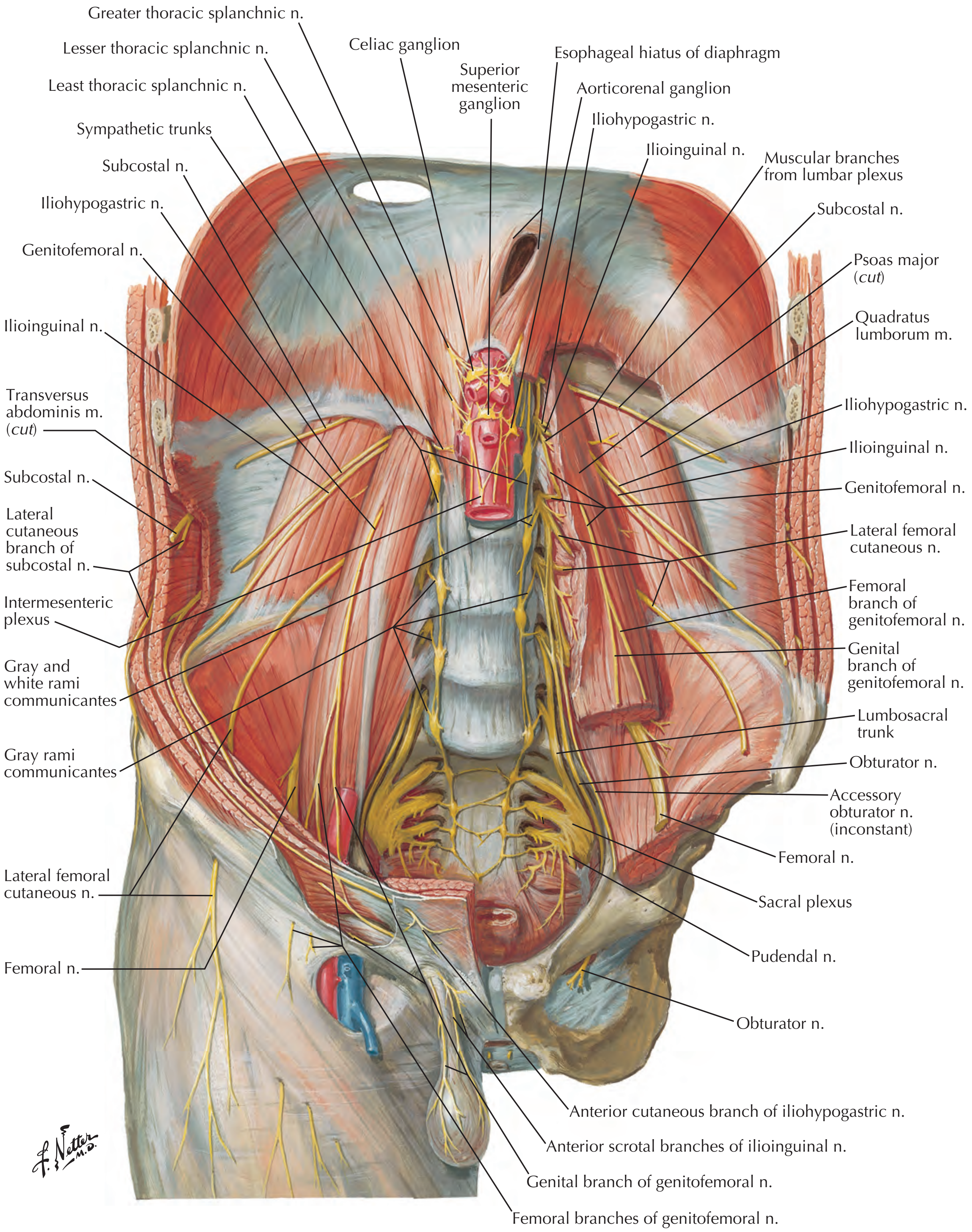

Inferior phrenic vv.
Inferior vena cava
Right inferior suprarenal v.
Right renal v.
Psoas major (cut)
Quadratus lumborum m.
Subcostal v.
Lumbar vv.
Iliolumbar v.
Common iliac v.
Ureter (cut)
Ovarian v. (cut)
Internal iliac v.
Median sacral v.
Lateral sacral vv.
Deep circumflex iliac v.
Superficial circumflex iliac v.
Inferior epigastric v. (cut)
Superficial epigastric v. (cut)
Pubic v.
Femoral v.
Great saphenous v.
External pudendal v.
Diaphragm
Hepatic vv.
Esophagus
Anastomotic v. between suprarenal and inferior phrenic vv.
Left suprarenal v.
Left renal v.
Right and left ovarian vv.
Right and left ascending lumbar vv.
Common iliac v.
Internal iliac v.
Superior gluteal v.
Inferior gluteal v.
Internal pudendal v.
External iliac v.
Middle anorectal v.
Uterine v.
Superior vesical v.
Deep circumflex iliac v.
Obturator v.
Round ligament of uterus
Inferior epigastric v.
Anorectal venous plexus
Uterovaginal venous plexus
Vesical venous plexus
Anterior abdominal wall (turned down)
F. Netter M.D.

Lymph Vessels and Lymph Nodes of Posterior Abdominal Wall

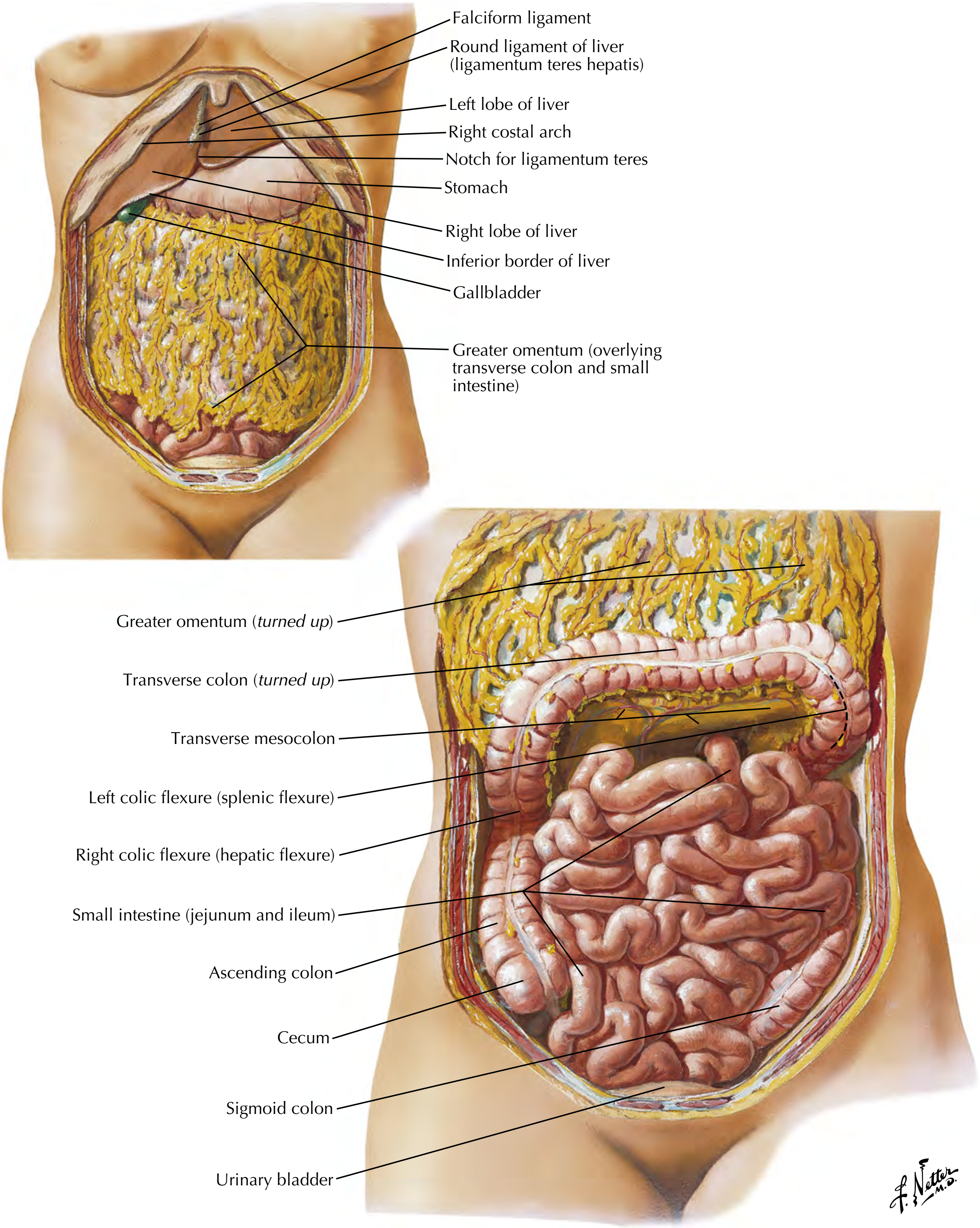
See also **Plates 338, 408**


Thoracic duct
Right subclavian trunk
Tracheobronchial nodes
Esophagus (*cut*)
Inferior diaphragmatic nodes
Thoracic duct
Celiac nodes
Superior mesenteric nodes
Inferior mesenteric node
Visceral lymph nodes
Cisterna chyli
Right lumbar trunk
Intestinal trunk
Left lumbar trunk
Right lumbar nodes
Left lumbar nodes
Common iliac nodes
Common iliac nodes
Median sacral nodes
Internal iliac nodes
Lateral sacral nodes
External iliac nodes
Superficial inguinal nodes
Inferior epigastric node
Proximal deep inguinal node (of Cloquet or Rosenmüller)
Deep inguinal nodes

See also **Plates 216, 412**

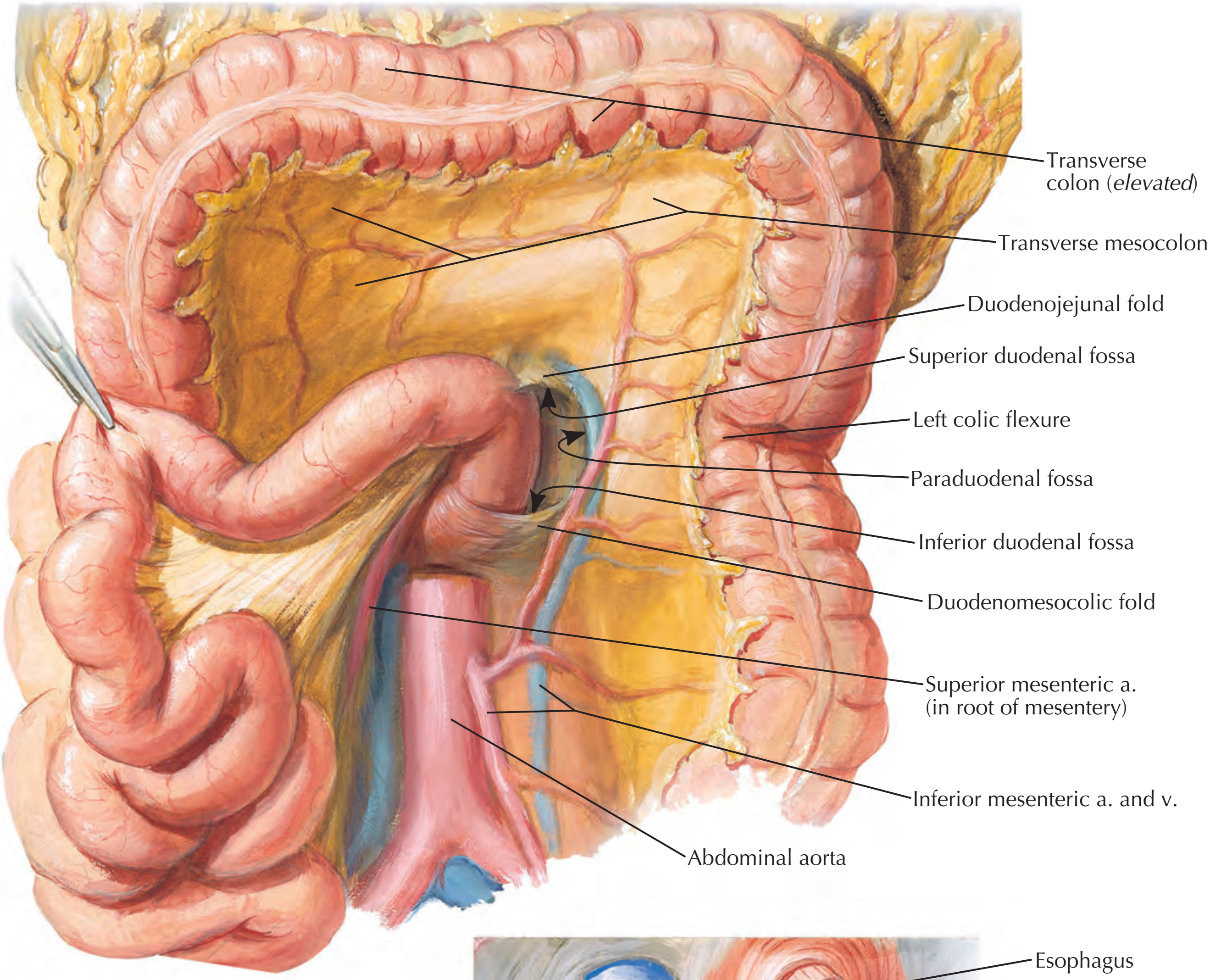

Greater thoracic splanchnic n.
Lesser thoracic splanchnic n.
Least thoracic splanchnic n.
Sympathetic trunks
Subcostal n.
Iliohypogastric n.
Genitofemoral n.
Ilioinguinal n.
Transversus abdominis m. (*cut*)
Subcostal n.
Lateral cutaneous branch of subcostal n.
Intermesenteric plexus
Gray and white rami communicantes
Gray rami communicantes
Lateral femoral cutaneous n.
Femoral n.
Celiac ganglion
Superior mesenteric ganglion
Esophageal hiatus of diaphragm
Aorticorenal ganglion
Iliohypogastric n.
Ilioinguinal n.
Muscular branches from lumbar plexus
Subcostal n.
Psoas major (*cut*)
Quadratus lumborum m.
Iliohypogastric n.
Ilioinguinal n.
Genitofemoral n.
Lateral femoral cutaneous n.
Femoral branch of genitofemoral n.
Genital branch of genitofemoral n.
Lumbosacral trunk
Obturator n.
Accessory obturator n. (inconstant)
Femoral n.
Sacral plexus
Pudendal n.
Obturator n.
Anterior cutaneous branch of iliohypogastric n.
Anterior scrotal branches of ilioinguinal n.
Genital branch of genitofemoral n.
Femoral branches of genitofemoral n.
F. Netter M.D.

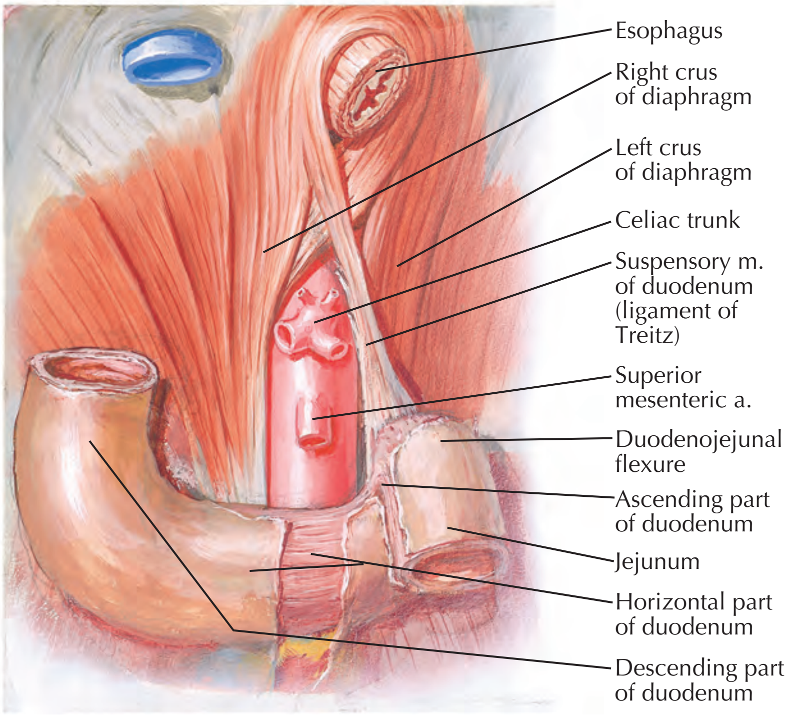
Greater Omentum and Abdominal Viscera


Falciform ligament
Round ligament of liver (ligamentum teres hepatis)
Left lobe of liver
Right costal arch
Notch for ligamentum teres
Stomach
Right lobe of liver
Inferior border of liver
Gallbladder
Greater omentum (overlying transverse colon and small intestine)
Greater omentum (*turned up*)
Transverse colon (*turned up*)
Transverse mesocolon
Left colic flexure (splenic flexure)
Right colic flexure (hepatic flexure)
Small intestine (jejunum and ileum)
Ascending colon
Cecum
Sigmoid colon
Urinary bladder

Mesenteries and Suspensory Muscle of Duodenum

See also Plate 306


Transverse colon (*elevated*)
Transverse mesocolon
Duodenojejunal fold
Superior duodenal fossa
Left colic flexure
Paraduodenal fossa
Inferior duodenal fossa
Duodenomesocolic fold
Superior mesenteric a. (in root of mesentery)
Inferior mesenteric a. and v.
Abdominal aorta

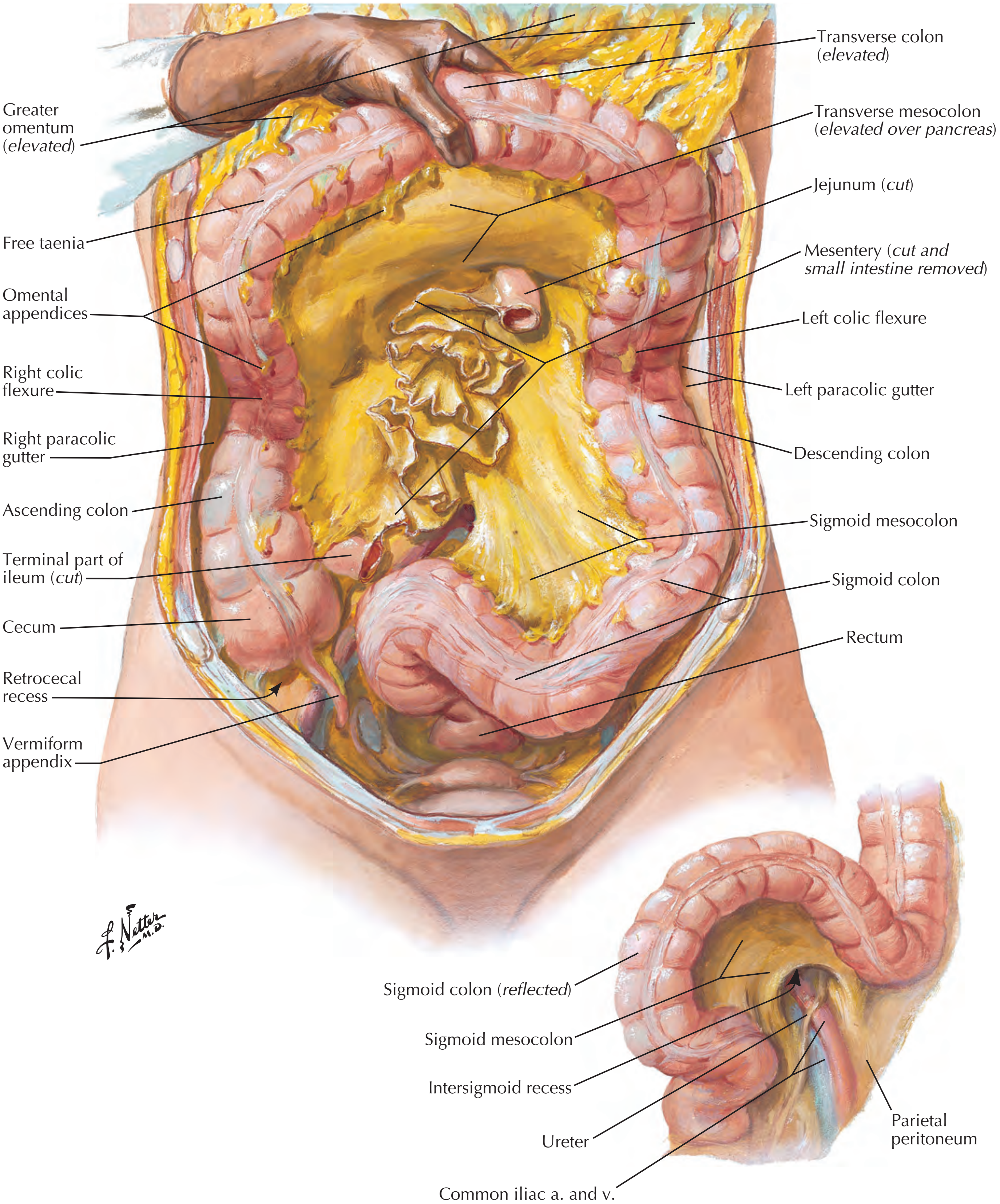

Esophagus
Right crus of diaphragm
Left crus of diaphragm
Celiac trunk
Suspensory m. of duodenum (ligament of Treitz)
Superior mesenteric a.
Duodenojejunal flexure
Ascending part of duodenum
Jejunum
Horizontal part of duodenum
Descending part of duodenum

Exposure of suspensory muscle of duodenum

F. Netter M.D.

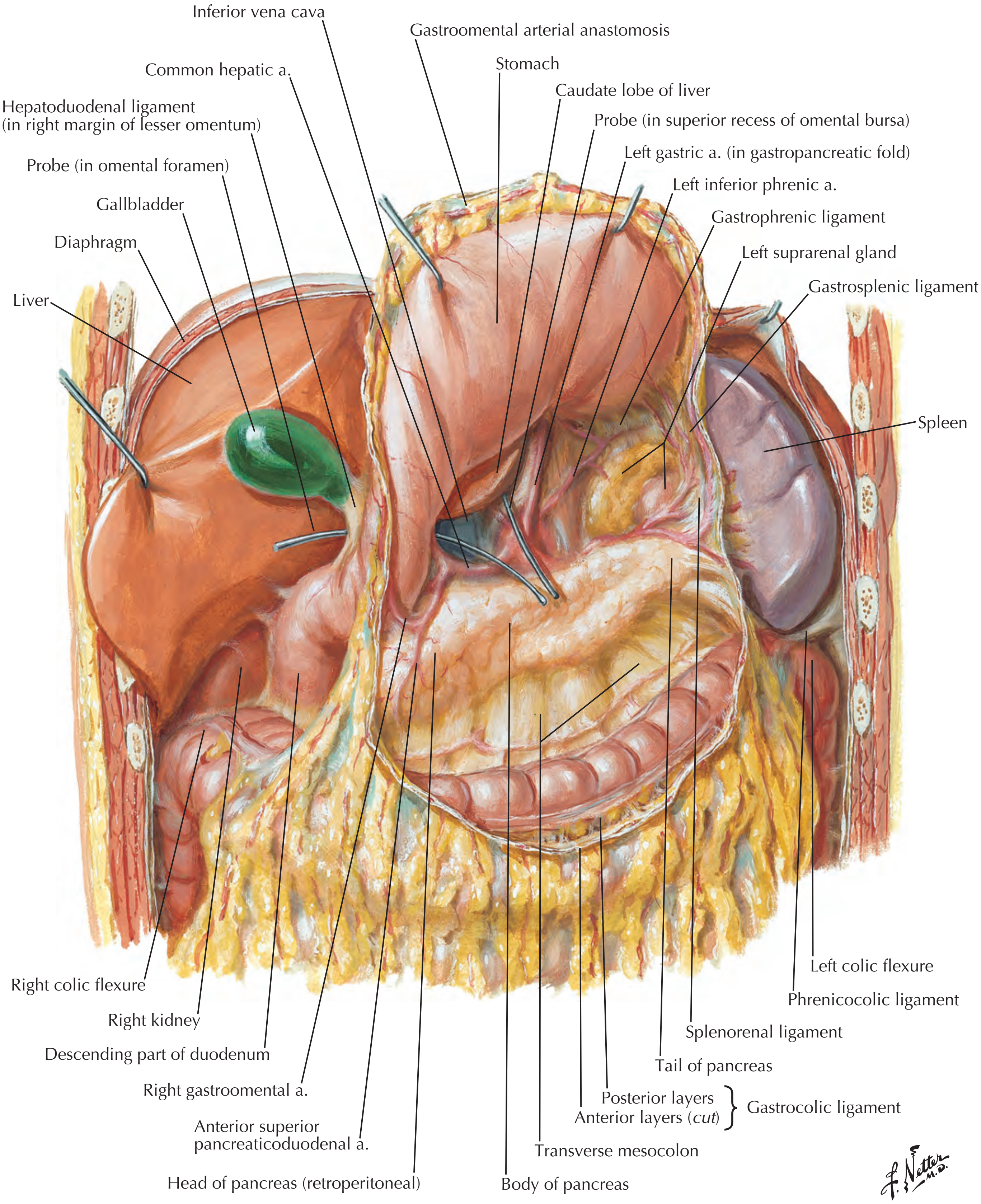
Mesocolons and Root of Mesentery

See also **Plates 314, BP 60**

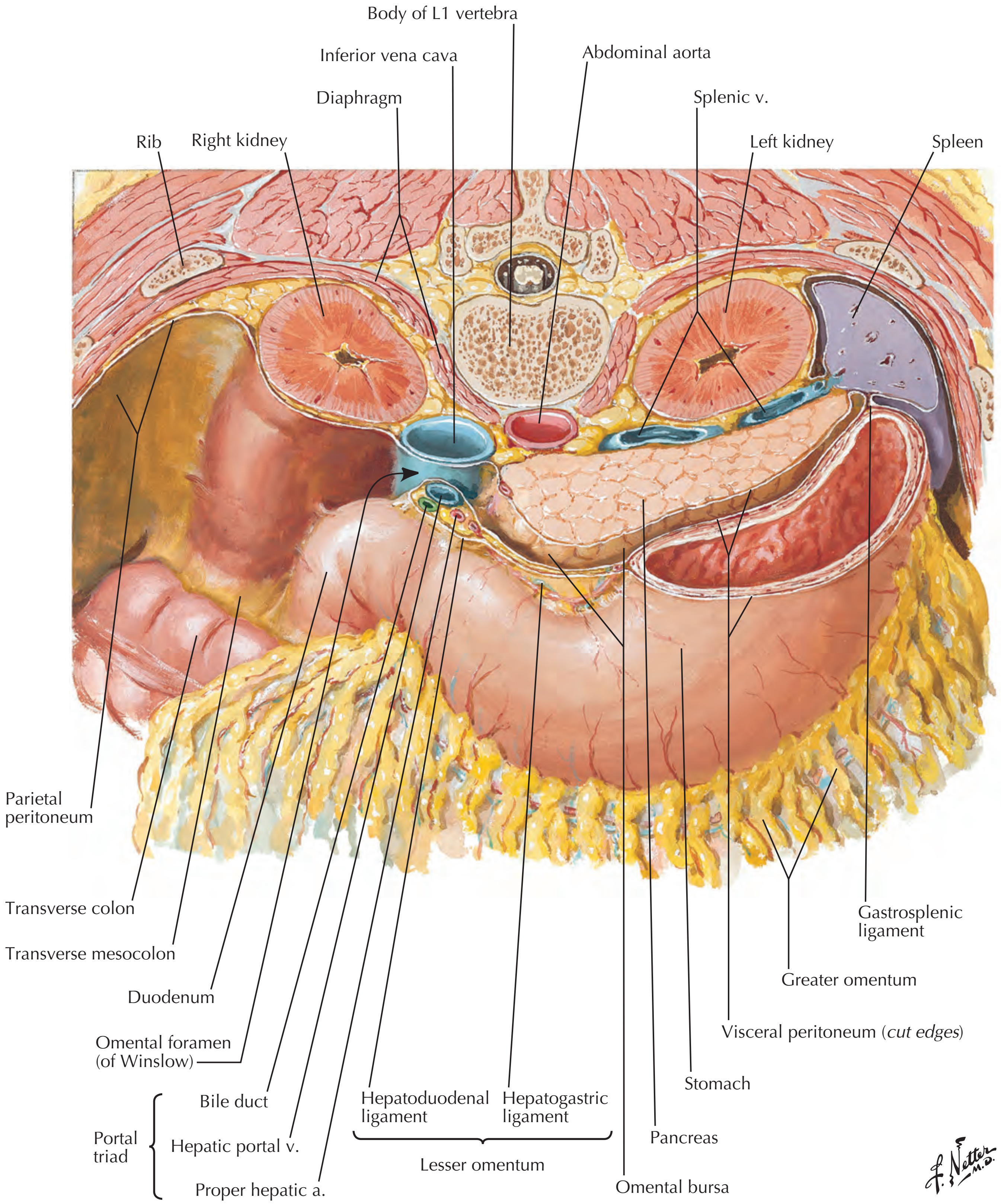

Greater omentum (*elevated*)
Free taenia
Omental appendices
Right colic flexure
Right paracolic gutter
Ascending colon
Terminal part of ileum (*cut*)
Cecum
Retrocecal recess
Vermiform appendix
Transverse colon (*elevated*)
Transverse mesocolon (*elevated over pancreas*)
Jejunum (*cut*)
Mesentery (*cut and small intestine removed*)
Left colic flexure
Left paracolic gutter
Descending colon
Sigmoid mesocolon
Sigmoid colon
Rectum
Sigmoid colon (*reflected*)
Sigmoid mesocolon
Intersigmoid recess
Ureter
Common iliac a. and v.
Parietal peritoneum

Omental Bursa: Stomach Reflected

See also **Plates 306, 310**

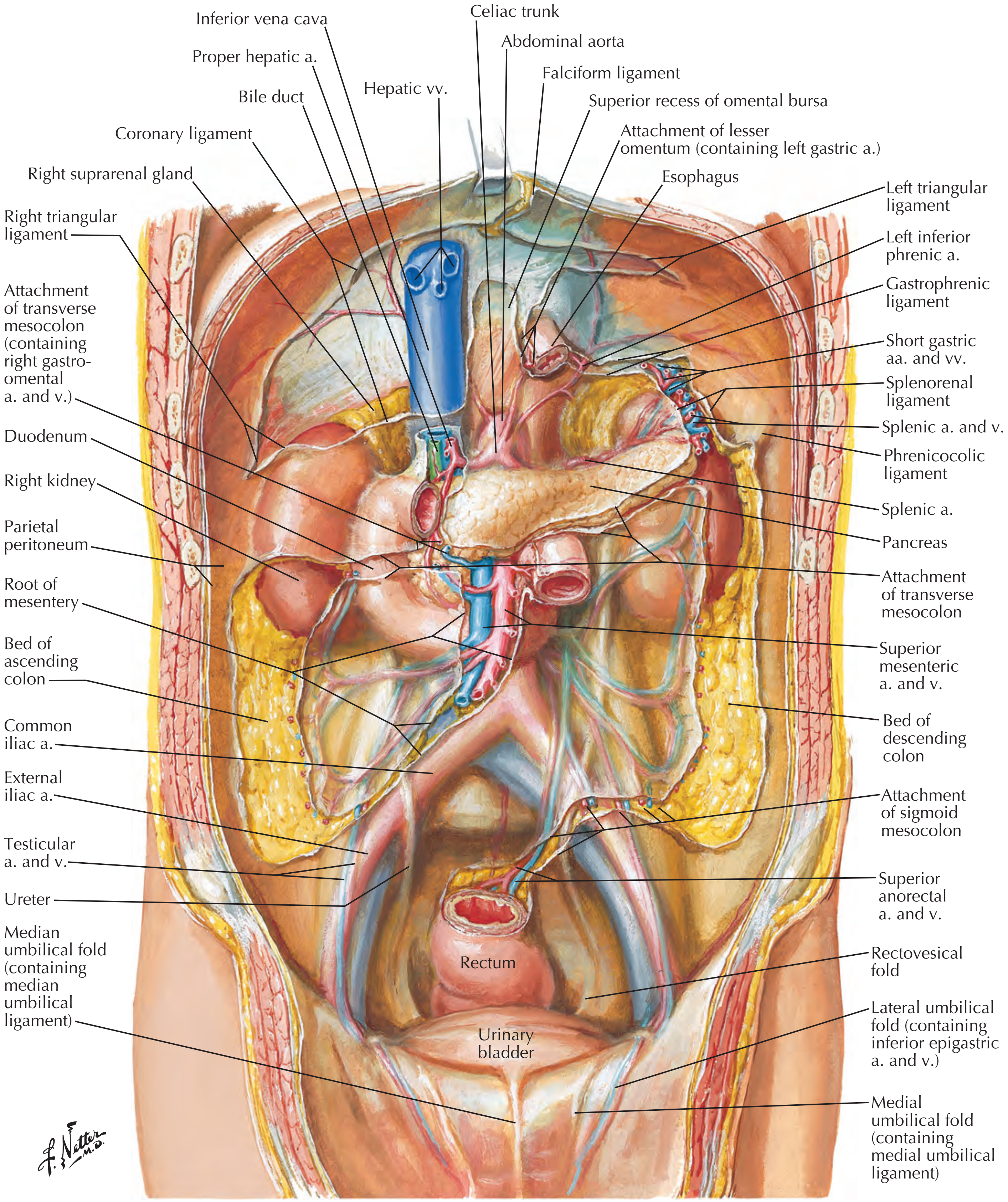

Inferior vena cava
Gastroomental arterial anastomosis
Common hepatic a.
Stomach
Caudate lobe of liver
Hepatoduodenal ligament (in right margin of lesser omentum)
Probe (in superior recess of omental bursa)
Left gastric a. (in gastropancreatic fold)
Probe (in omental foramen)
Left inferior phrenic a.
Gallbladder
Gastrophrenic ligament
Diaphragm
Left suprarenal gland
Gastrosplenic ligament
Liver
Spleen
Left colic flexure
Right colic flexure
Phrenicocolic ligament
Right kidney
Splenorenal ligament
Descending part of duodenum
Tail of pancreas
Right gastroomental a.
Posterior layers
Anterior layers (cut)
Gastrocolic ligament
Anterior superior pancreaticoduodenal a.
Transverse mesocolon
Head of pancreas (retroperitoneal)
Body of pancreas
F. Netter M.D.

See also **Plate 294**

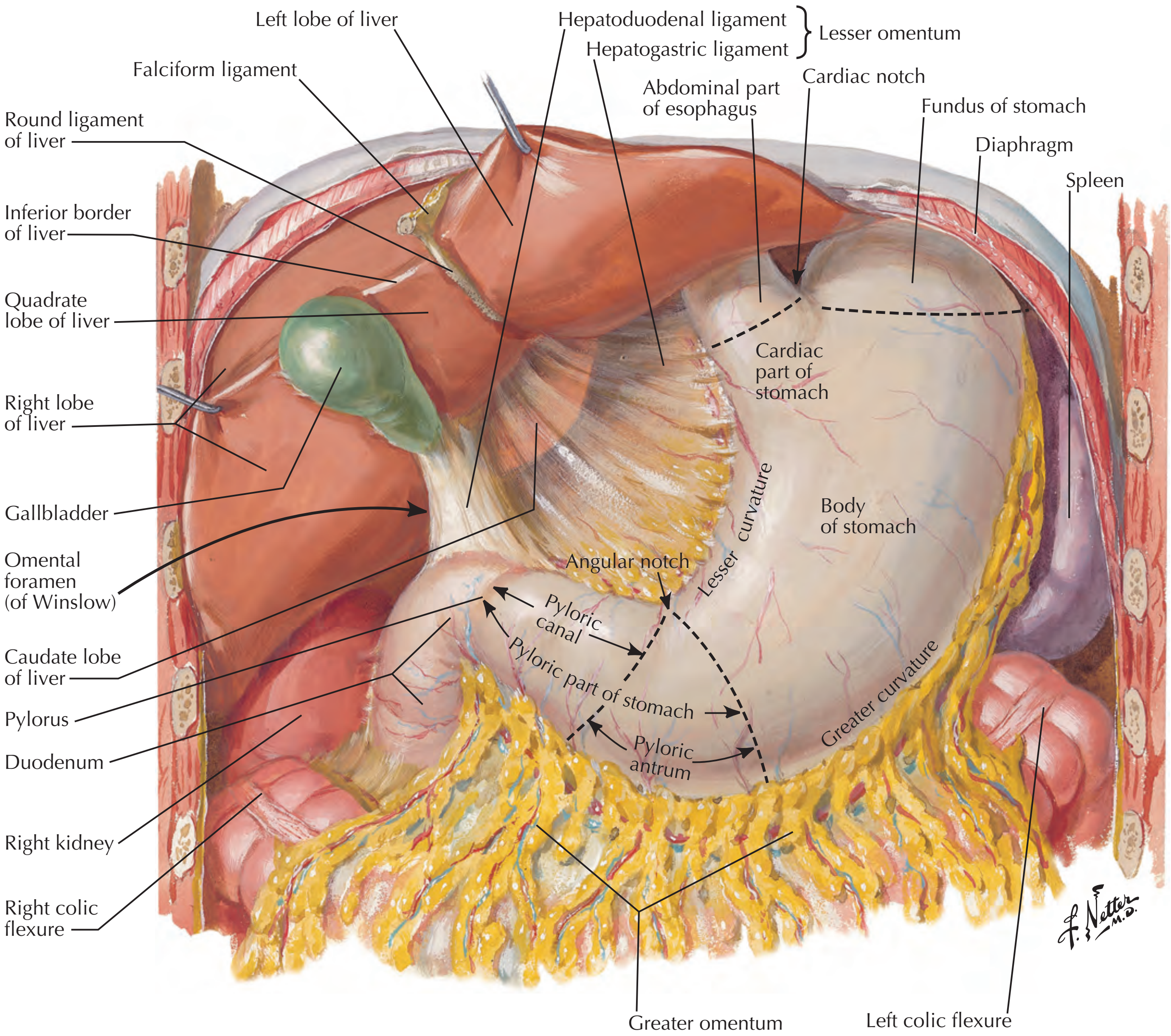

Body of L1 vertebra
Inferior vena cava
Abdominal aorta
Diaphragm
Splenic v.
Rib
Right kidney
Left kidney
Spleen
Parietal peritoneum
Transverse colon
Transverse mesocolon
Duodenum
Omental foramen (of Winslow)
Portal triad
Bile duct
Hepatic portal v.
Proper hepatic a.
Hepatoduodenal ligament
Hepatogastric ligament
Lesser omentum
Omental bursa
Pancreas
Stomach
Visceral peritoneum (*cut edges*)
Greater omentum
Gastrosplenic ligament

Peritoneum of Posterior Abdominal Wall

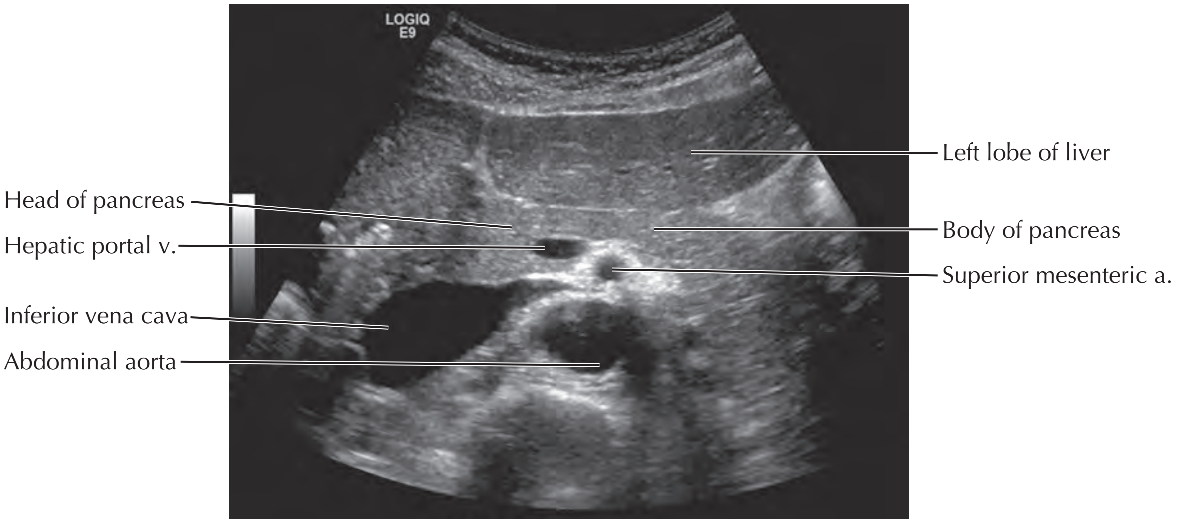
See also **Plate 296**


Inferior vena cava
Celiac trunk
Abdominal aorta
Proper hepatic a.
Falciform ligament
Bile duct
Hepatic vv.
Superior recess of omental bursa
Coronary ligament
Attachment of lesser omentum (containing left gastric a.)
Right suprarenal gland
Esophagus
Right triangular ligament
Left triangular ligament
Left inferior phrenic a.
Attachment of transverse mesocolon (containing right gastro-omental a. and v.)
Gastrophrenic ligament
Short gastric aa. and vv.
Splenorenal ligament
Duodenum
Splenic a. and v.
Phrenicocolic ligament
Right kidney
Splenic a.
Parietal peritoneum
Pancreas
Root of mesentery
Attachment of transverse mesocolon
Bed of ascending colon
Superior mesenteric a. and v.
Bed of descending colon
Common iliac a.
External iliac a.
Attachment of sigmoid mesocolon
Testicular a. and v.
Superior anorectal a. and v.
Ureter
Rectum
Rectovesical fold
Median umbilical fold (containing median umbilical ligament)
Urinary bladder
Lateral umbilical fold (containing inferior epigastric a. and v.)
Medial umbilical fold (containing medial umbilical ligament)
F. Netter M.D.

See also **Plate BP 55**

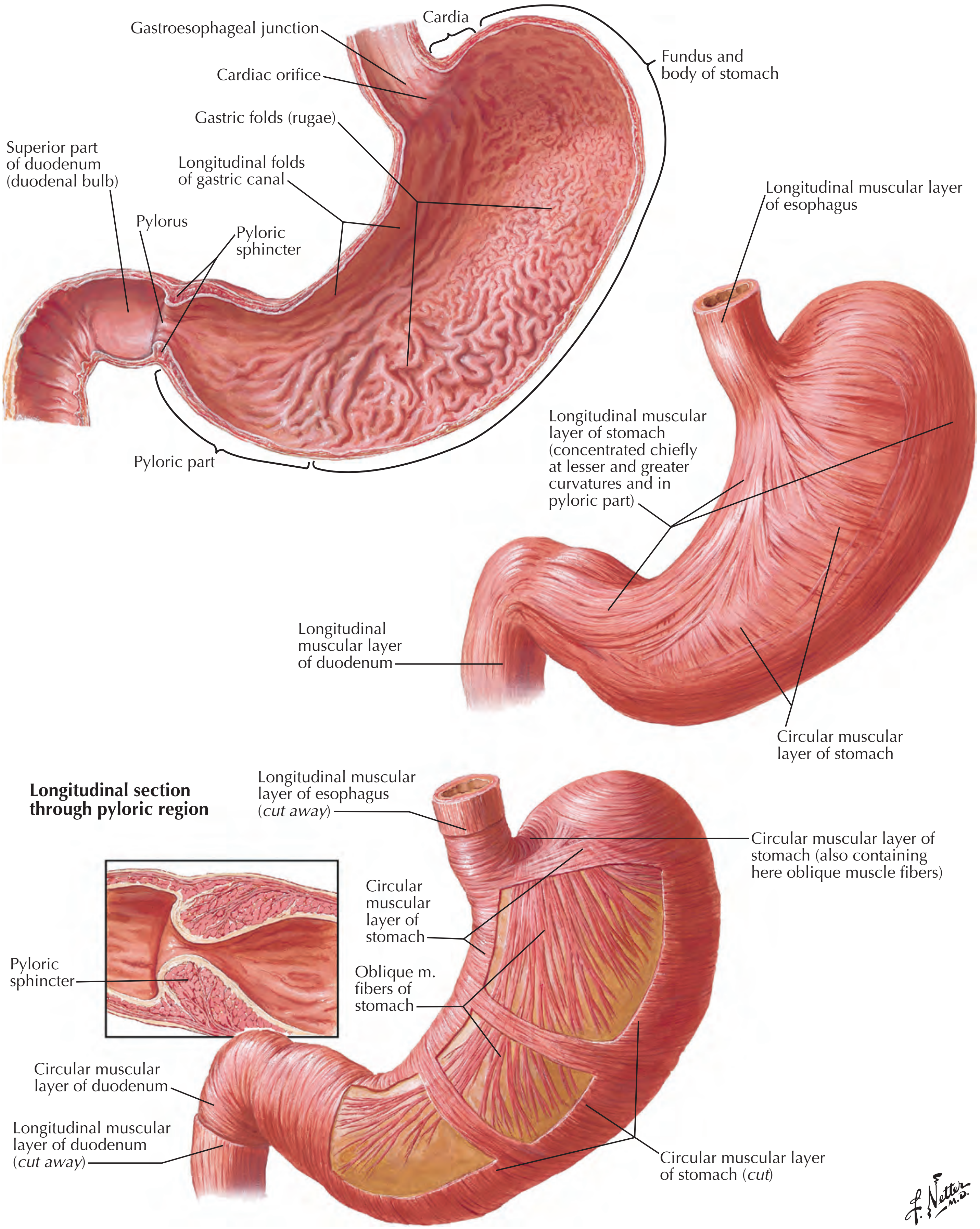

Left lobe of liver
Falciform ligament
Round ligament of liver
Inferior border of liver
Quadrate lobe of liver
Right lobe of liver
Gallbladder
Omental foramen (of Winslow)
Caudate lobe of liver
Pylorus
Duodenum
Right kidney
Right colic flexure
Hepatoduodenal ligament
Hepatogastric ligament
Lesser omentum
Abdominal part of esophagus
Cardiac notch
Fundus of stomach
Diaphragm
Spleen
Cardiac part of stomach
Lesser curvature
Body of stomach
Angular notch
Pyloric canal
Pyloric part of stomach
Pyloric antrum
Greater curvature
Greater omentum
Left colic flexure

Transverse gray-scale ultrasound image of midabdomen


LOGIQ E9
Head of pancreas
Hepatic portal v.
Inferior vena cava
Abdominal aorta
Left lobe of liver
Body of pancreas
Superior mesenteric a.

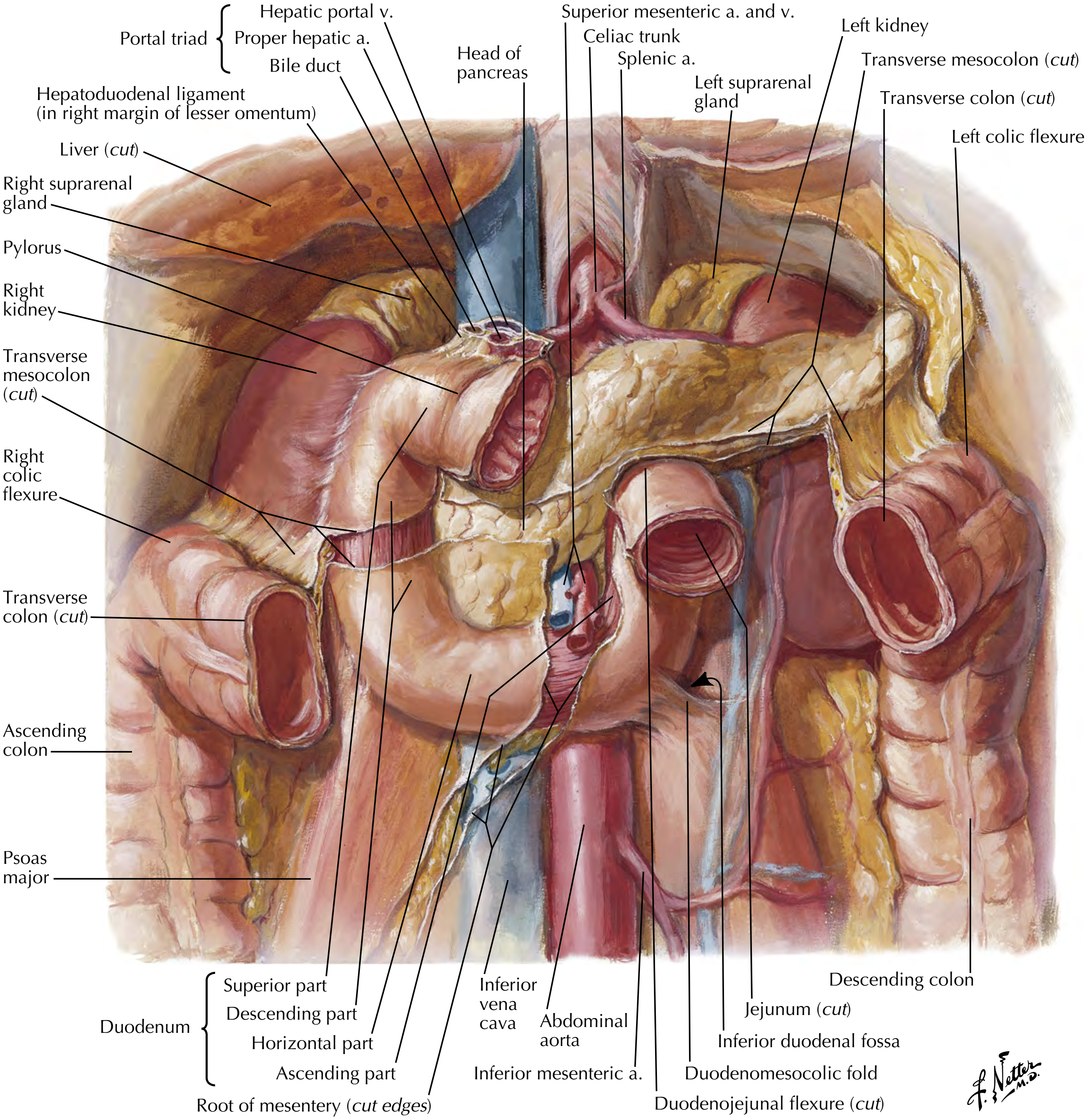
Mucosa of Stomach

See also **Plate BP 55**

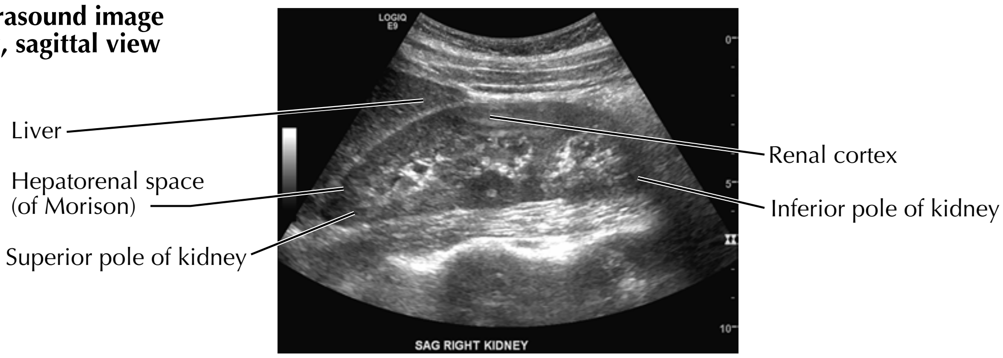

Cardia
Gastroesophageal junction
Cardiac orifice
Fundus and body of stomach
Gastric folds (rugae)
Superior part of duodenum (duodenal bulb)
Longitudinal folds of gastric canal
Pylorus
Pyloric sphincter
Pyloric part
Longitudinal muscular layer of esophagus
Longitudinal muscular layer of stomach (concentrated chiefly at lesser and greater curvatures and in pyloric part)
Longitudinal muscular layer of duodenum
Circular muscular layer of stomach
Longitudinal section through pyloric region
Longitudinal muscular layer of esophagus (*cut away*)
Circular muscular layer of stomach (also containing here oblique muscle fibers)
Circular muscular layer of stomach
Pyloric sphincter
Oblique m. fibers of stomach
Circular muscular layer of duodenum
Longitudinal muscular layer of duodenum (*cut away*)
Circular muscular layer of stomach (*cut*)

Duodenum in Situ

See also **Plate 293**

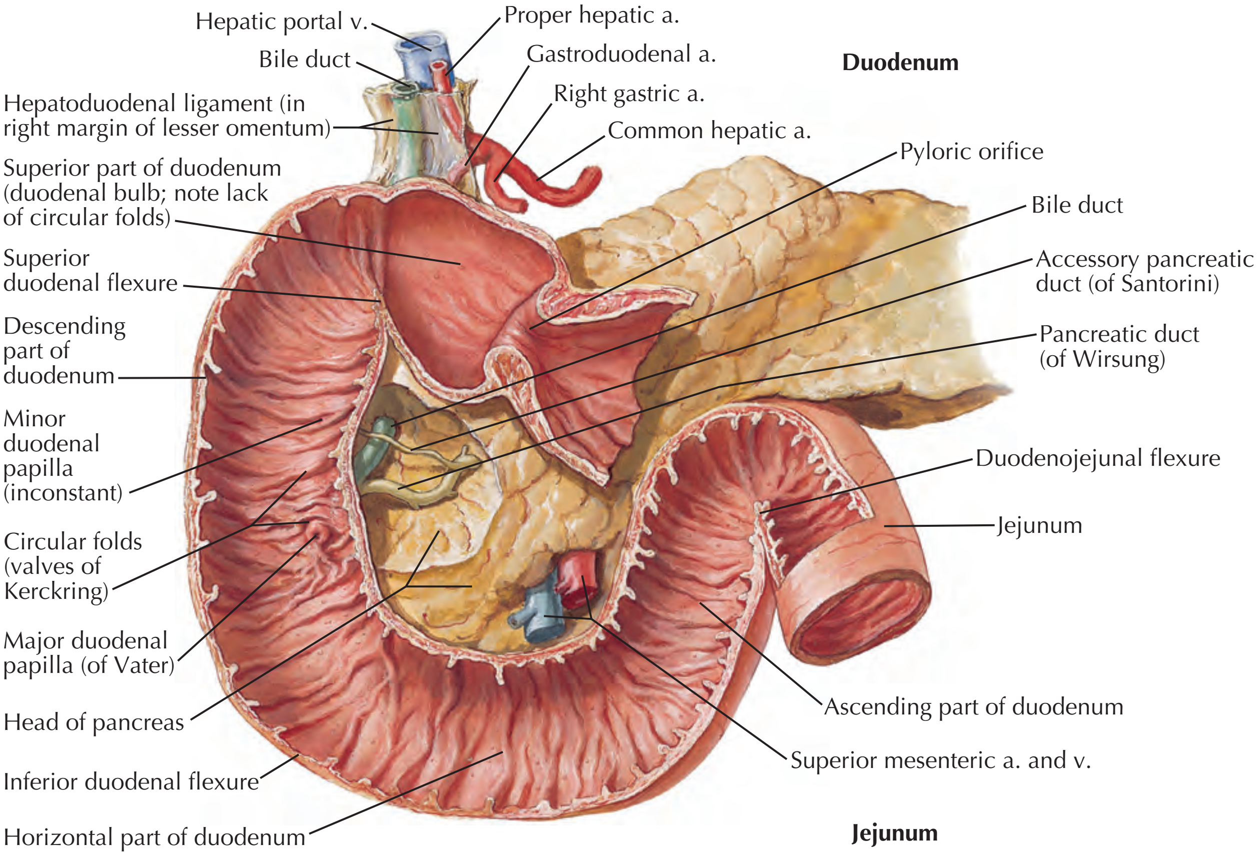

Portal triad
Hepatic portal v.
Proper hepatic a.
Bile duct
Hepatoduodenal ligament (in right margin of lesser omentum)
Liver (*cut*)
Right suprarenal gland
Pylorus
Right kidney
Transverse mesocolon (*cut*)
Right colic flexure
Transverse colon (*cut*)
Ascending colon
Psoas major
Head of pancreas
Superior mesenteric a. and v.
Celiac trunk
Splenic a.
Left suprarenal gland
Left kidney
Transverse mesocolon (*cut*)
Transverse colon (*cut*)
Left colic flexure
Duodenum
Superior part
Descending part
Horizontal part
Ascending part
Root of mesentery (*cut edges*)
Inferior vena cava
Abdominal aorta
Inferior mesenteric a.
Descending colon
Jejunum (*cut*)
Inferior duodenal fossa
Duodenomesocolic fold
Duodenojejunal flexure (*cut*)

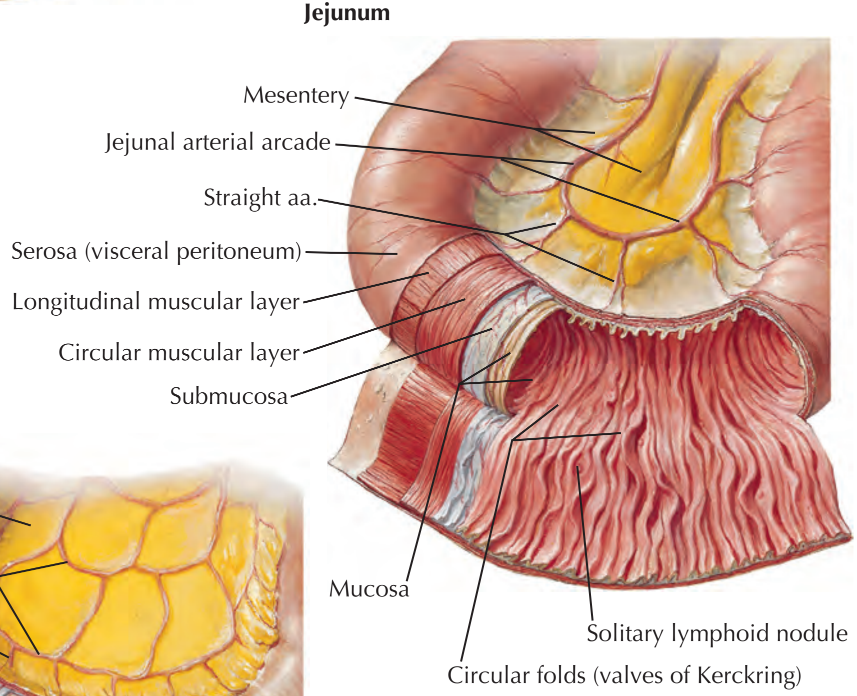
Gray-scale ultrasound image of right kidney, sagittal view

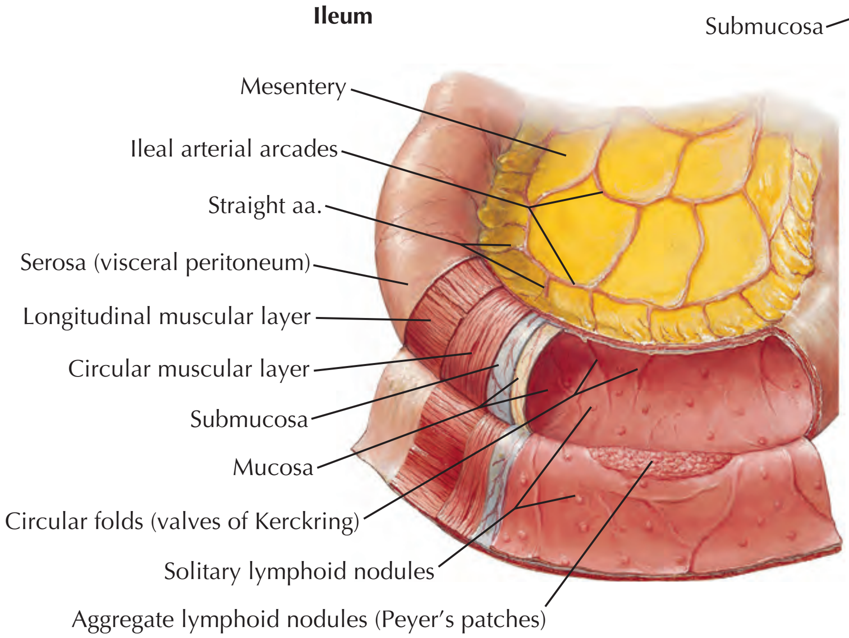

LOGIQ E9
0
5
10
SAG RIGHT KIDNEY
Liver
Hepatorenal space (of Morison)
Superior pole of kidney
Renal cortex
Inferior pole of kidney

Mucosa and Musculature of Small Intestine

See also **Plates 295, BP 56, BP 62**

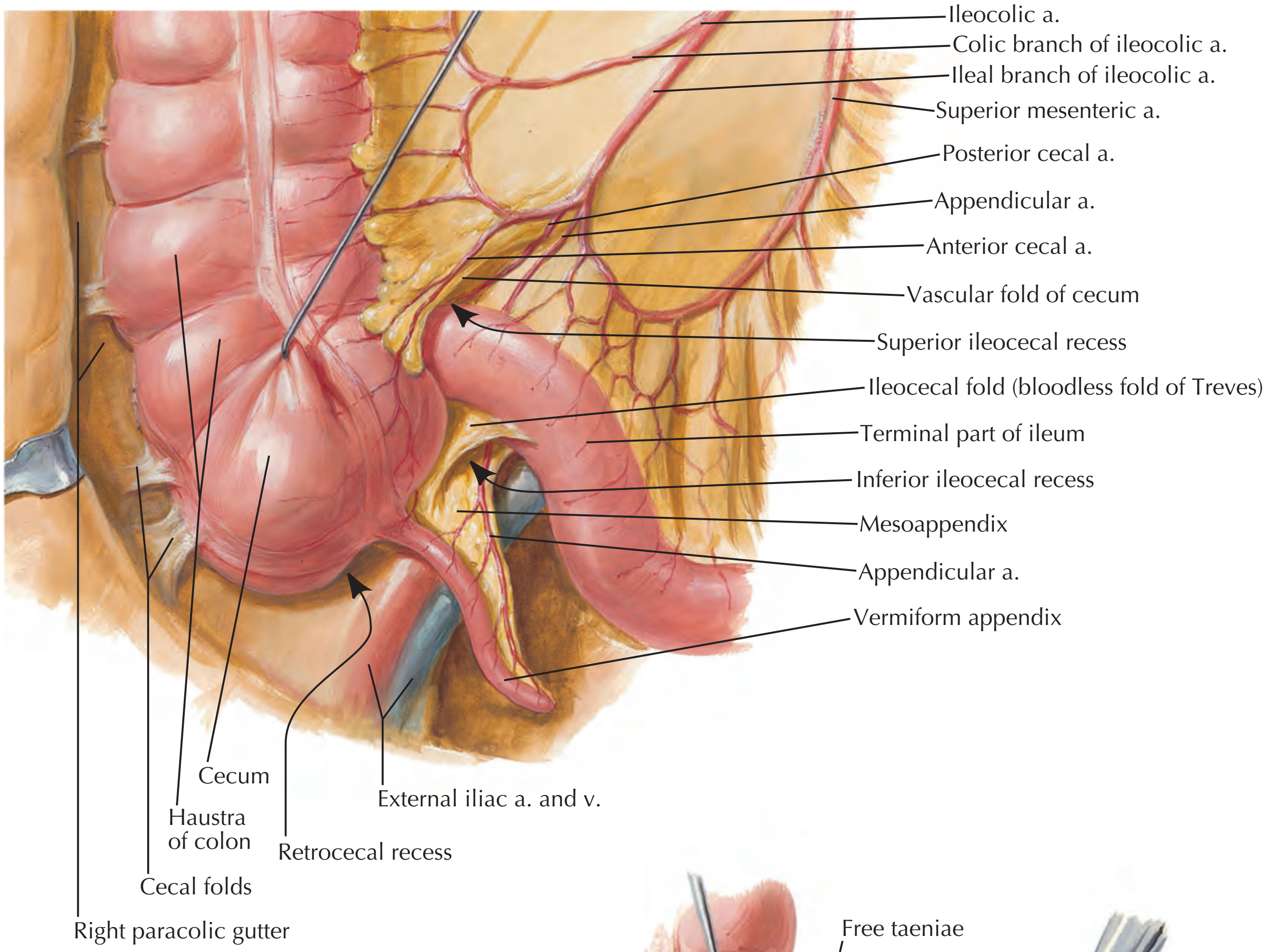

Duodenum
Hepatic portal v.
Bile duct
Hepatoduodenal ligament (in right margin of lesser omentum)
Superior part of duodenum (duodenal bulb; note lack of circular folds)
Superior duodenal flexure
Descending part of duodenum
Minor duodenal papilla (inconstant)
Circular folds (valves of Kerckring)
Major duodenal papilla (of Vater)
Head of pancreas
Inferior duodenal flexure
Horizontal part of duodenum
Proper hepatic a.
Gastroduodenal a.
Right gastric a.
Common hepatic a.
Pyloric orifice
Bile duct
Accessory pancreatic duct (of Santorini)
Pancreatic duct (of Wirsung)
Duodenojejunal flexure
Jejunum
Ascending part of duodenum
Superior mesenteric a. and v.

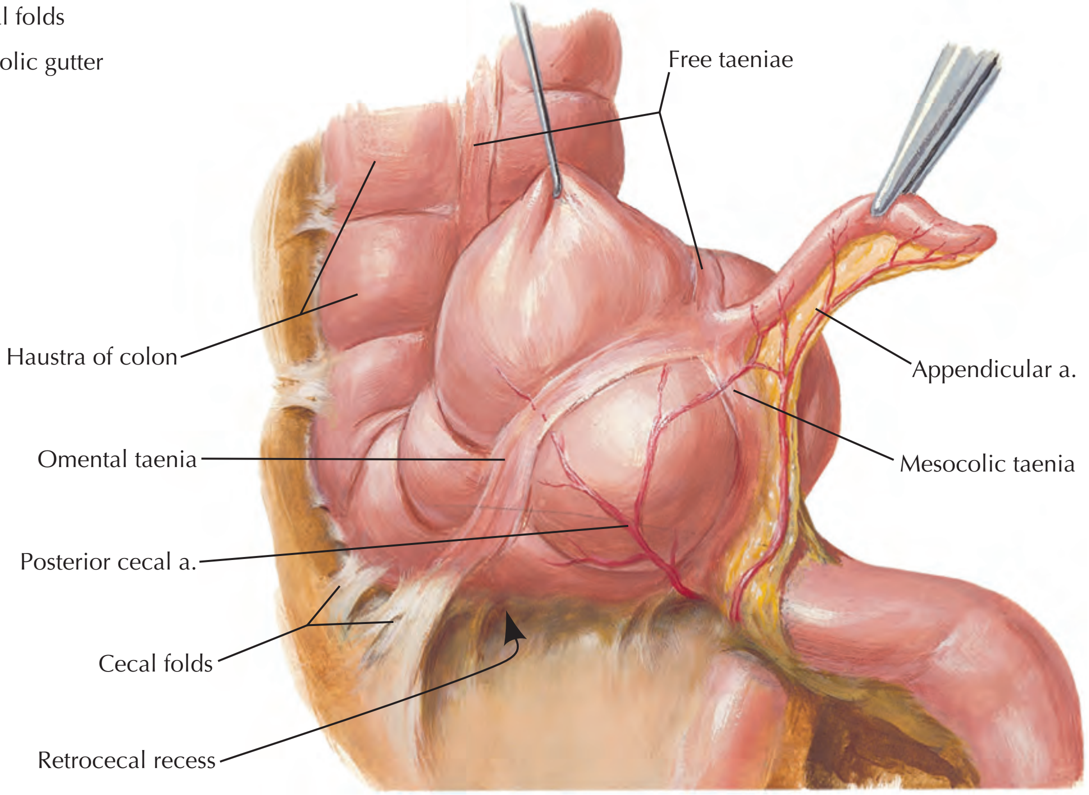

Jejunum
Mesentery
Jejunal arterial arcade
Straight aa.
Serosa (visceral peritoneum)
Longitudinal muscular layer
Circular muscular layer
Submucosa
Mucosa
Solitary lymphoid nodule
Circular folds (valves of Kerckring)


Ileum
Mesentery
Ileal arterial arcades
Straight aa.
Serosa (visceral peritoneum)
Longitudinal muscular layer
Circular muscular layer
Submucosa
Mucosa
Circular folds (valves of Kerckring)
Solitary lymphoid nodules
Aggregate lymphoid nodules (Peyer's patches)

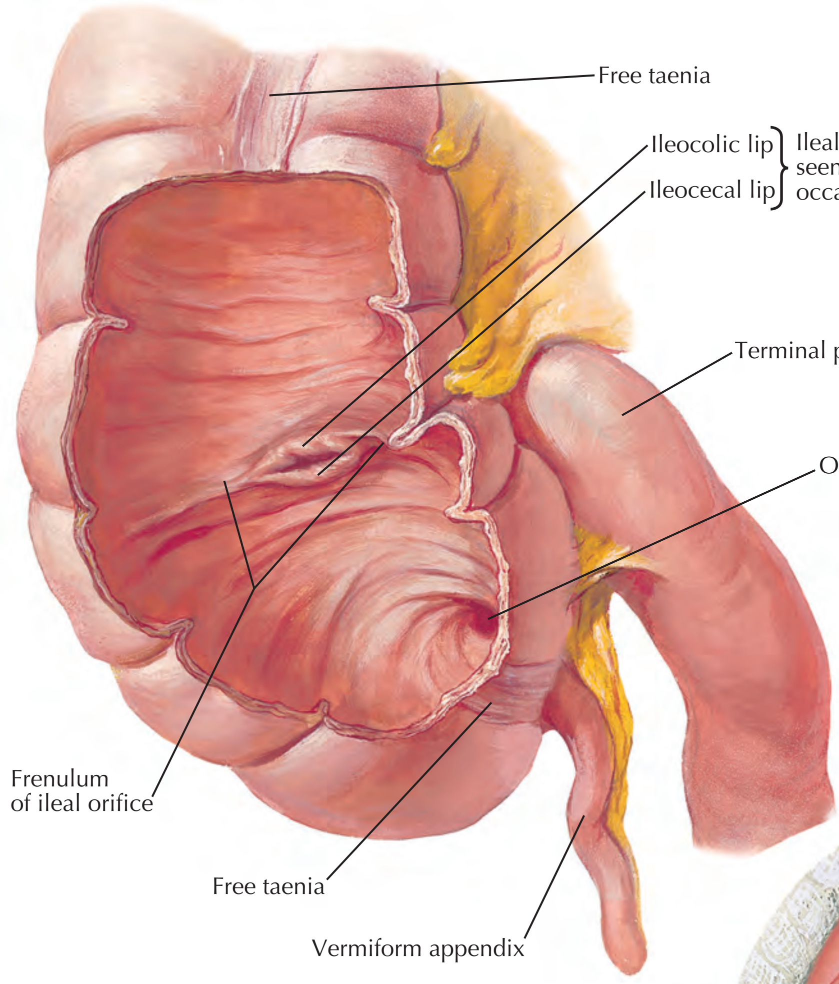
F. Netter M.D.

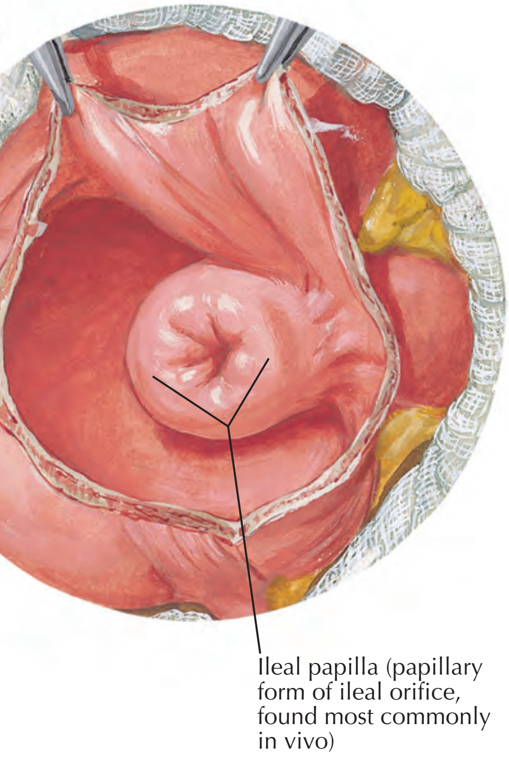
See also **Plates 313, 314, BP 61**

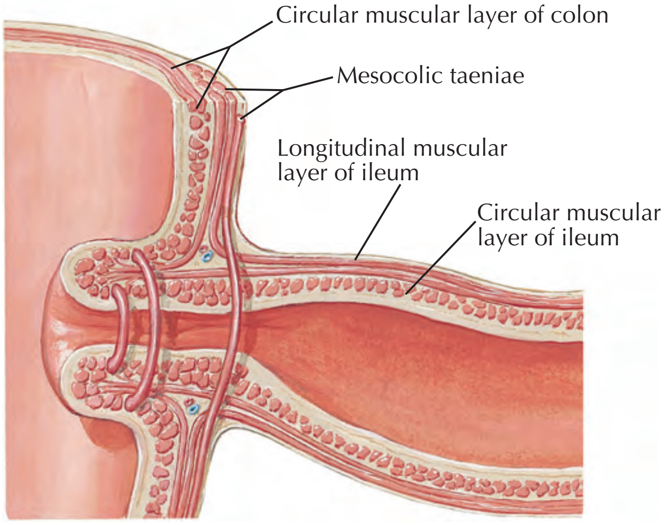

Ileocolic a.
Colic branch of ileocolic a.
Ileal branch of ileocolic a.
Superior mesenteric a.
Posterior cecal a.
Appendicular a.
Anterior cecal a.
Vascular fold of cecum
Superior ileocecal recess
Ileocecal fold (bloodless fold of Treves)
Terminal part of ileum
Inferior ileocecal recess
Mesoappendix
Appendicular a.
Vermiform appendix
Cecum
External iliac a. and v.
Haustra of colon
Retrocecal recess
Cecal folds
Right paracolic gutter


Free taeniae
Haustra of colon
Appendicular a.
Omental taenia
Mesocolic taenia
Posterior cecal a.
Cecal folds
Retrocecal recess

See also **Plate BP 57**


Free taenia
Ileocolic lip
Ileocecal lip
Ileal lips (labial form of ileal orifice, seen commonly postmortem and occasionally in vivo)
Terminal part of ileum
Orifice of vermiform appendix
Frenulum of ileal orifice
Free taenia
Vermiform appendix

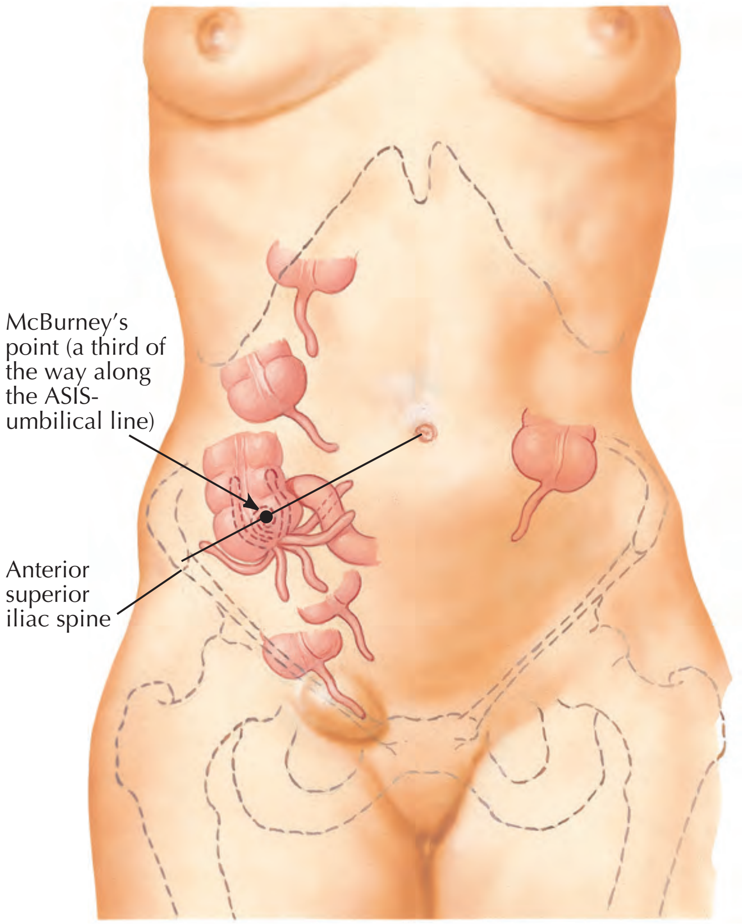

Ileal papilla (papillary form of ileal orifice, found most commonly in vivo)


Circular muscular layer of colon
Mesocolic taeniae
Longitudinal muscular layer of ileum
Circular muscular layer of ileum

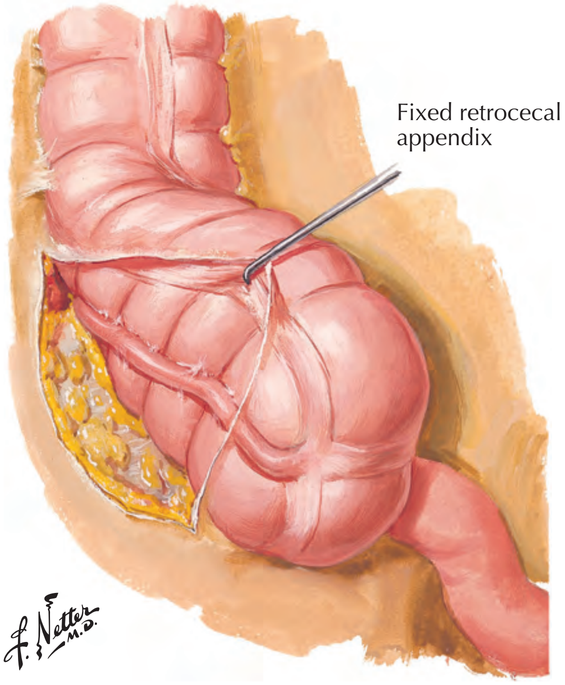
Schema of muscle fibers at ileal orifice

F. Netter M.D.

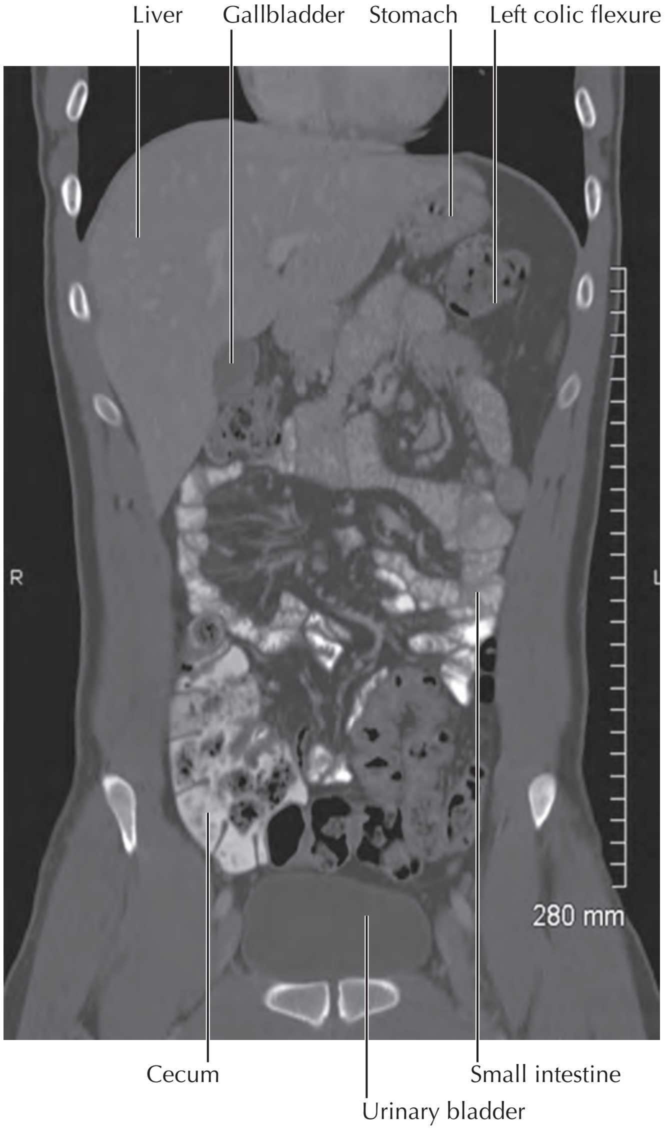
Vermiform Appendix


McBurney's point (a third of the way along the ASIS-umbilical line)
Anterior superior iliac spine

Variations in position of vermiform appendix

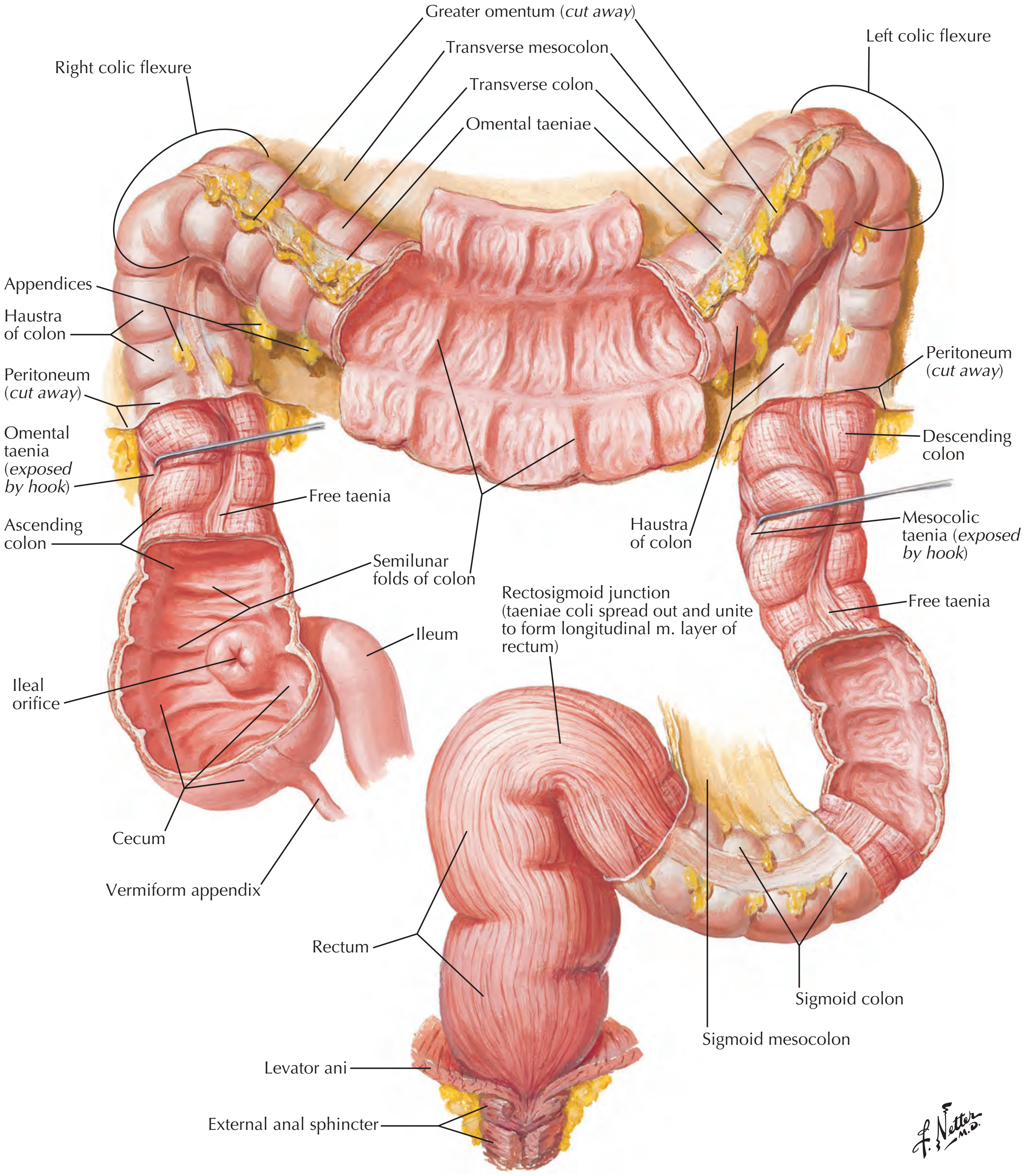

Fixed retrocecal appendix

Coronal CT image with oral and intravenous contrast


Liver
Gallbladder
Stomach
Left colic flexure
R
L
280 mm
Cecum
Small intestine
Urinary bladder

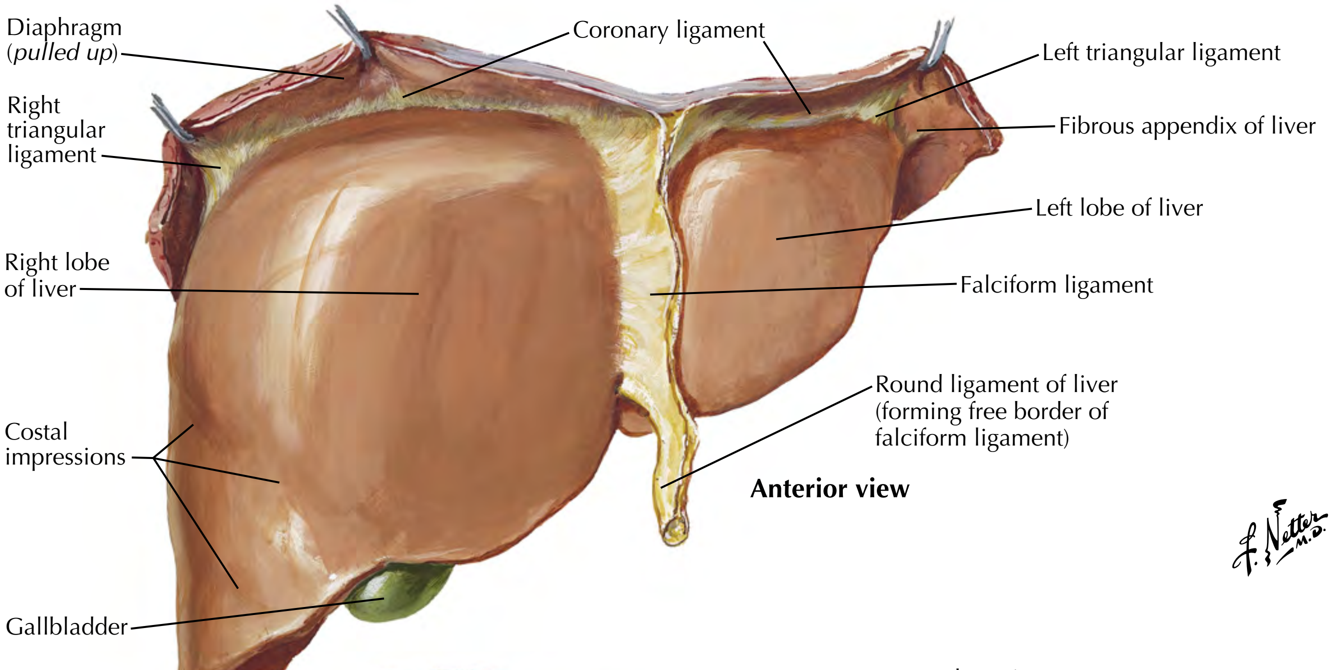
Mucosa and Musculature of Large Intestine

See also **Plates 314, BP 60**

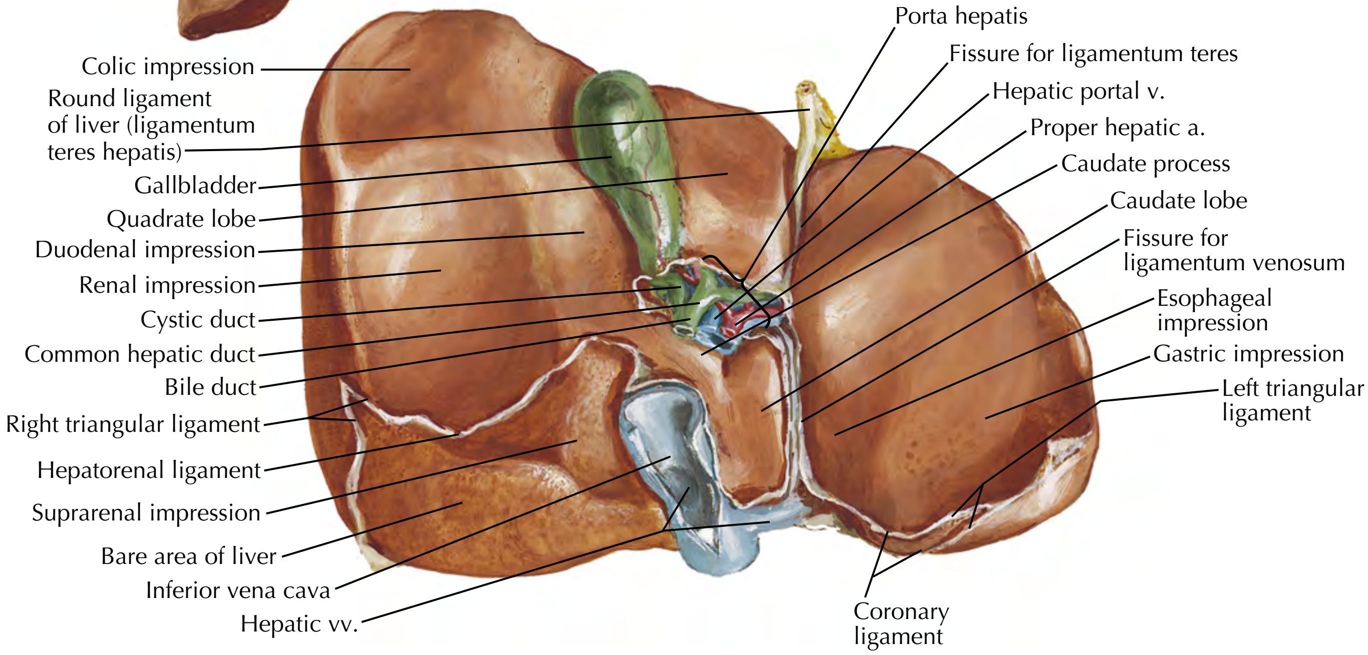

Greater omentum (*cut away*)
Transverse mesocolon
Transverse colon
Omental taeniae
Right colic flexure
Left colic flexure
Appendices
Haustra of colon
Peritoneum (*cut away*)
Omental taenia (*exposed by hook*)
Ascending colon
Free taenia
Semilunar folds of colon
Ileum
Ileal orifice
Cecum
Vermiform appendix
Rectum
Levator ani
External anal sphincter
Haustra of colon
Peritoneum (*cut away*)
Descending colon
Mesocolic taenia (*exposed by hook*)
Free taenia
Rectosigmoid junction (taeniae coli spread out and unite to form longitudinal m. layer of rectum)
Sigmoid mesocolon
Sigmoid colon
F. Netter M.D.

Surfaces and Bed of Liver

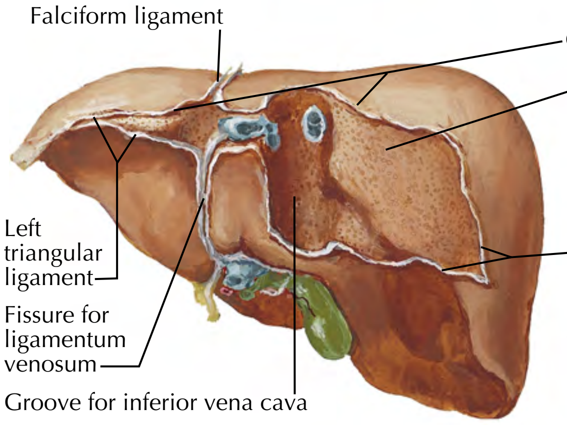
See also **Plates 293, BP 59**


Diaphragm
(*pulled up*)
Coronary ligament
Left triangular ligament
Right triangular ligament
Fibrous appendix of liver
Left lobe of liver
Right lobe of liver
Falciform ligament
Round ligament of liver (forming free border of falciform ligament)
Costal impressions
Gallbladder

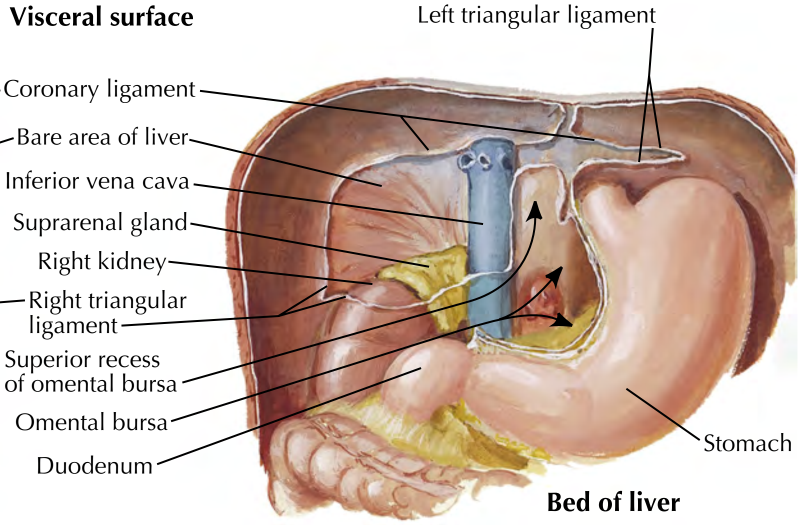
Anterior view


Porta hepatis
Fissure for ligamentum teres
Colic impression
Hepatic portal v.
Round ligament of liver (ligamentum teres hepatis)
Proper hepatic a.
Caudate process
Gallbladder
Caudate lobe
Quadrate lobe
Fissure for ligamentum venosum
Duodenal impression
Esophageal impression
Renal impression
Cystic duct
Gastric impression
Common hepatic duct
Left triangular ligament
Bile duct
Right triangular ligament
Hepatorenal ligament
Suprarenal impression
Bare area of liver
Inferior vena cava
Hepatic vv.
Coronary ligament

Visceral surface


Falciform ligament
Left triangular ligament
Fissure for ligamentum venosum
Groove for inferior vena cava

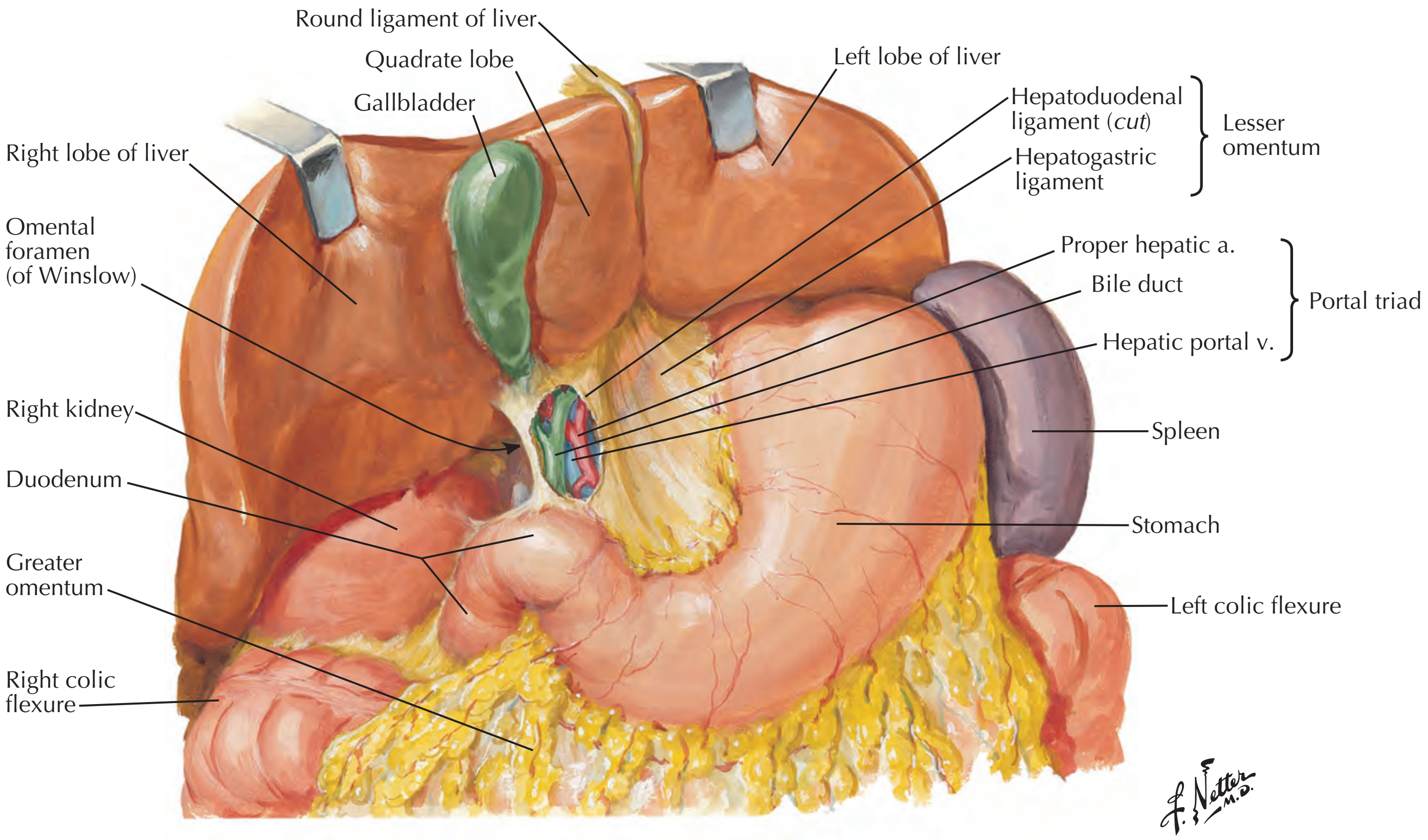
Posterior view

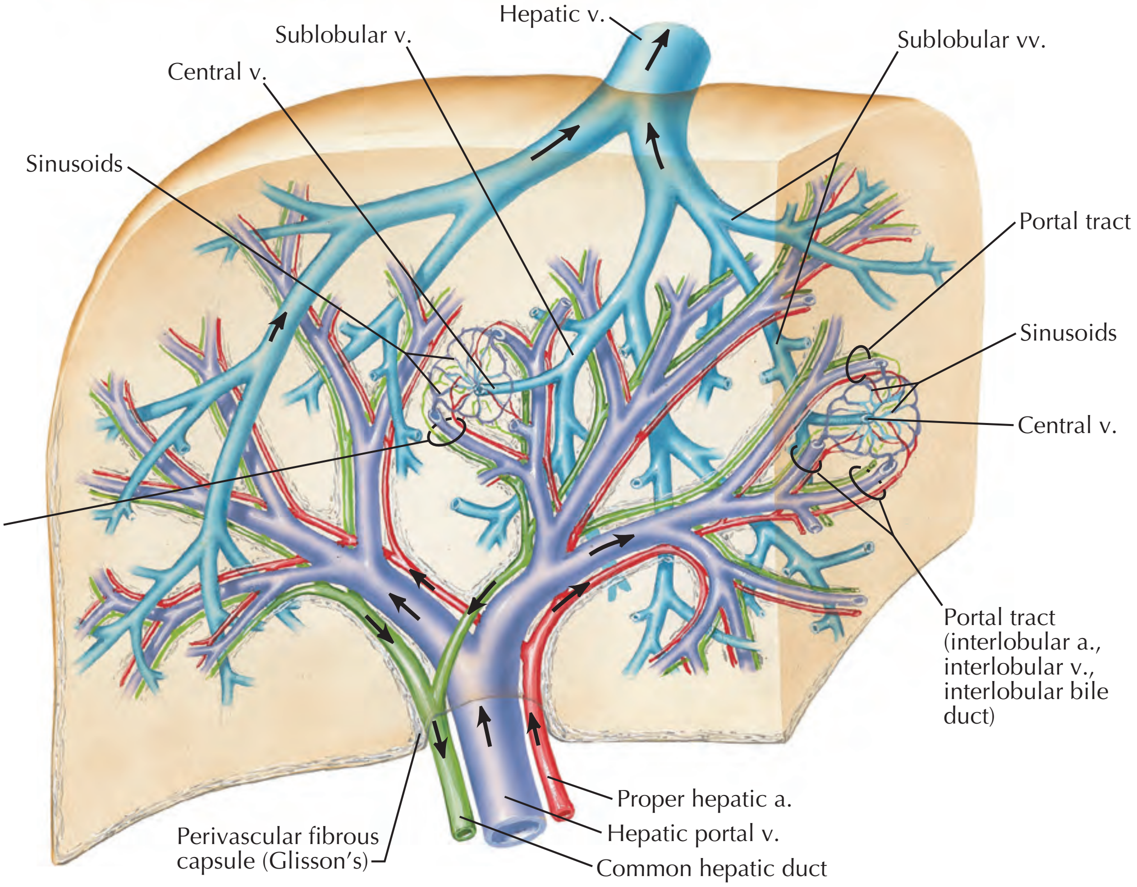

Left triangular ligament
Coronary ligament
Bare area of liver
Inferior vena cava
Suprarenal gland
Right kidney
Right triangular ligament
Superior recess of omental bursa
Omental bursa
Duodenum
Stomach

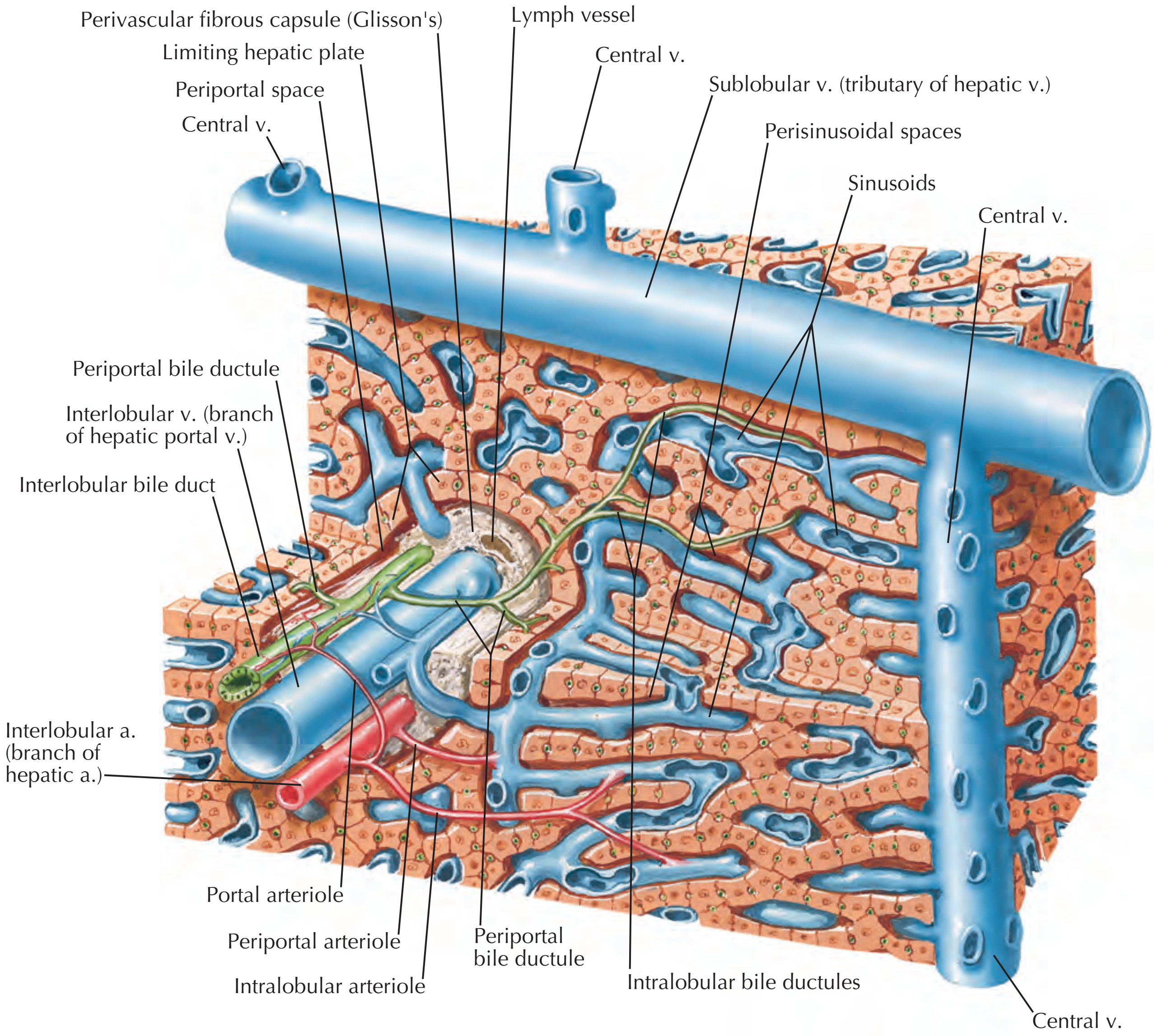
Bed of liver

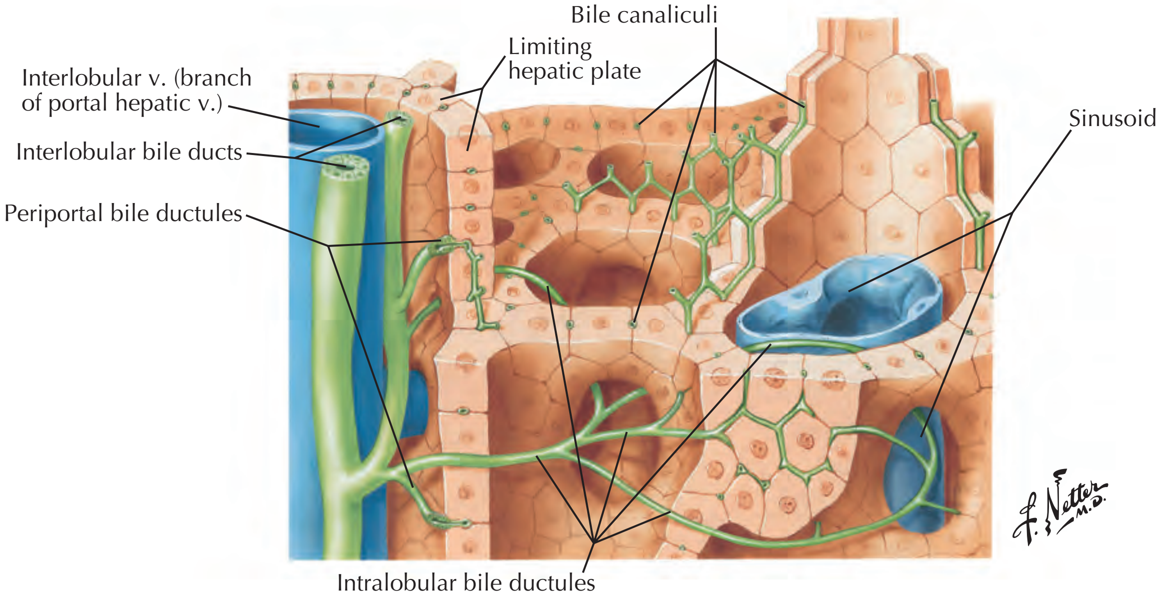
Liver in Situ: Vascular and Duct Systems

See also **Plates 292, BP 58**


Round ligament of liver
Quadrate lobe
Gallbladder
Left lobe of liver
Hepatoduodenal ligament (*cut*)
Hepatogastric ligament
Lesser omentum
Right lobe of liver
Omental foramen (of Winslow)
Proper hepatic a.
Bile duct
Hepatic portal v.
Portal triad
Right kidney
Spleen
Duodenum
Stomach
Greater omentum
Left colic flexure
Right colic flexure
F. Netter M.D.

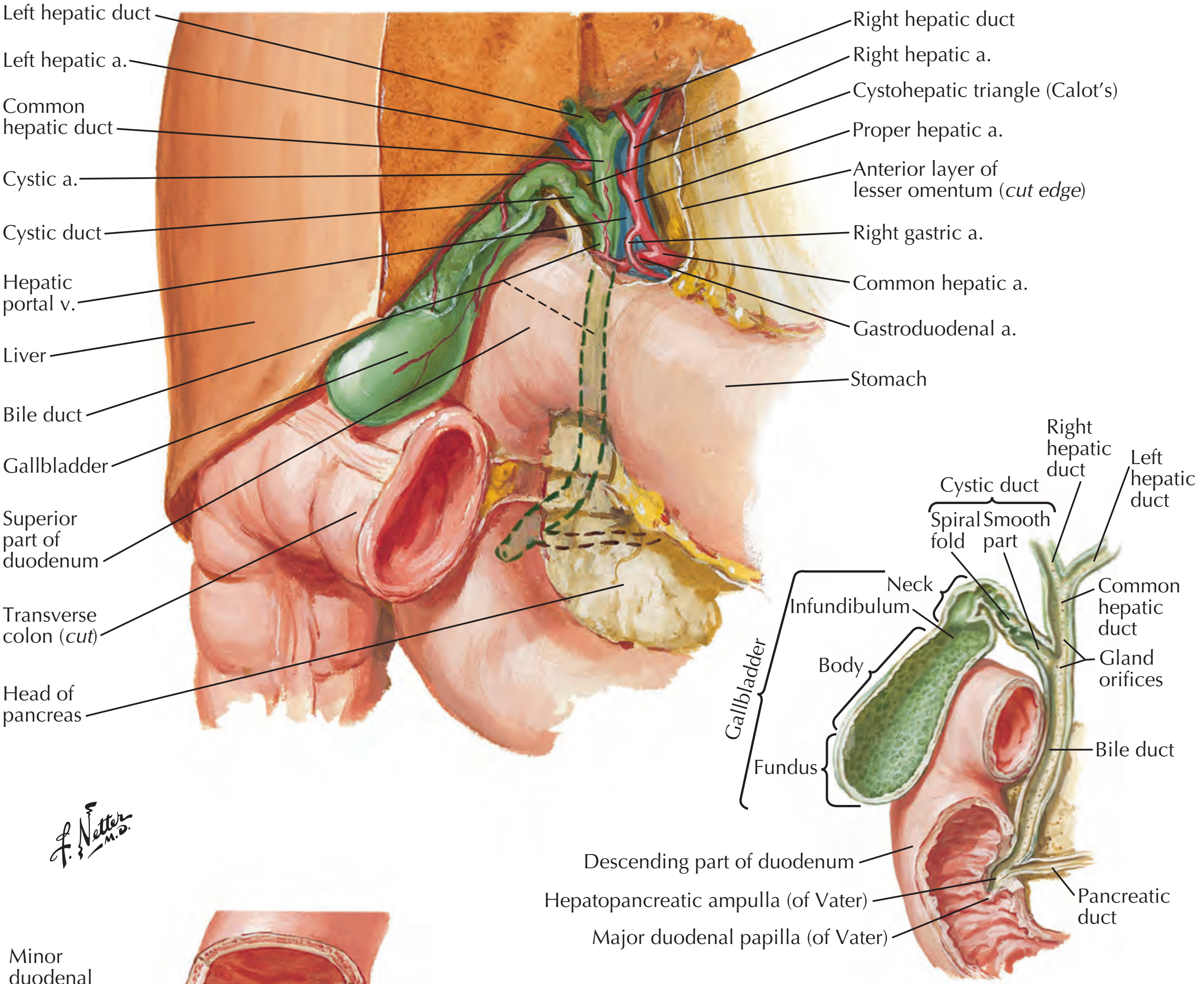

Hepatic v.
Sublobular v.
Sublobular vv.
Central v.
Sinusoids
Portal tract
Sinusoids
Central v.
Portal tract
Portal tract (interlobular a., interlobular v., interlobular bile duct)
Proper hepatic a.
Hepatic portal v.
Perivascular fibrous capsule (Glisson's)
Common hepatic duct

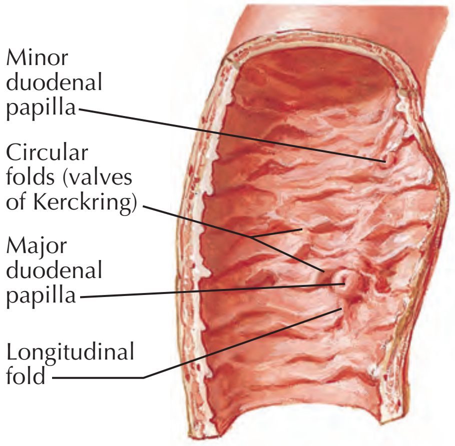

Perivascular fibrous capsule (Glisson's)
Limiting hepatic plate
Periportal space
Central v.
Lymph vessel
Central v.
Sublobular v. (tributary of hepatic v.)
Perisinusoidal spaces
Sinusoids
Central v.
Periportal bile ductule
Interlobular v. (branch of hepatic portal v.)
Interlobular bile duct
Interlobular a. (branch of hepatic a.)
Portal arteriole
Periportal arteriole
Intralobular arteriole
Periportal bile ductule
Intralobular bile ductules
Central v.


Bile canaliculi
Limiting hepatic plate
Interlobular v. (branch of portal hepatic v.)
Interlobular bile ducts
Periportal bile ductules
Sinusoid
Intralobular bile ductules

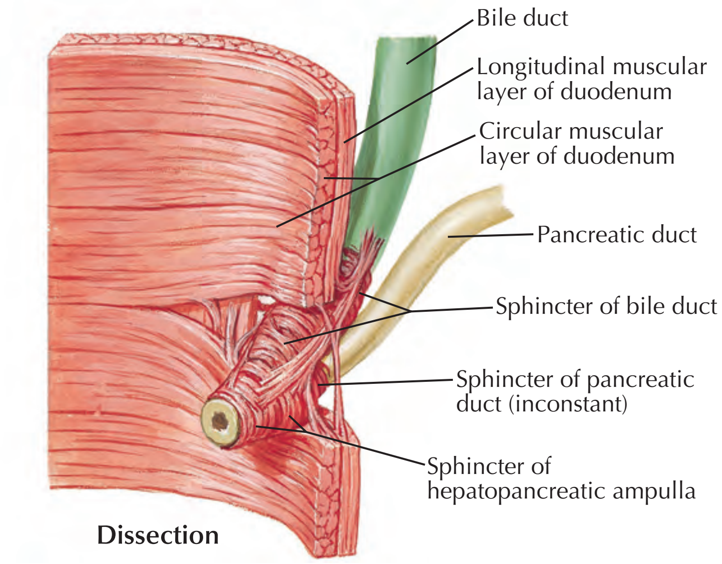
Gallbladder, Extrahepatic Bile Ducts, and Pancreatic Duct

See also **Plates BP 57, BP 62, BP 63**


Left hepatic duct
Left hepatic a.
Common hepatic duct
Cystic a.
Cystic duct
Hepatic portal v.
Liver
Bile duct
Gallbladder
Superior part of duodenum
Transverse colon (*cut*)
Head of pancreas
Right hepatic duct
Right hepatic a.
Cystohepatic triangle (Calot's)
Proper hepatic a.
Anterior layer of lesser omentum (*cut edge*)
Right gastric a.
Common hepatic a.
Gastroduodenal a.
Stomach
F. Netter M.D.
Right hepatic duct
Left hepatic duct
Cystic duct
Spiral fold
Smooth part
Common hepatic duct
Gland orifices
Neck
Infundibulum
Body
Gallbladder
Fundus
Bile duct
Descending part of duodenum
Hepatopancreatic ampulla (of Vater)
Major duodenal papilla (of Vater)
Pancreatic duct


Minor duodenal papilla
Circular folds (valves of Kerckring)
Major duodenal papilla
Longitudinal fold

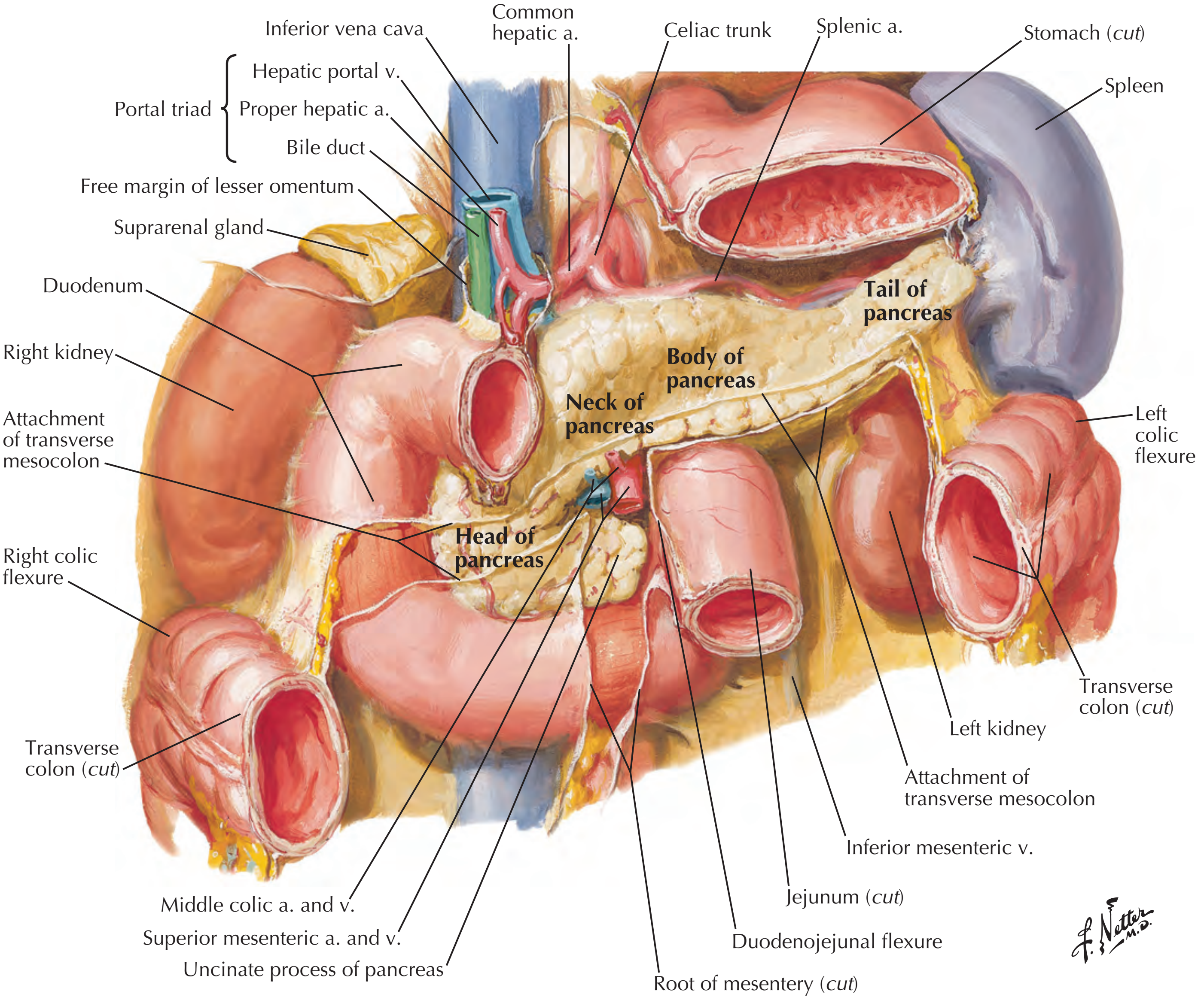
Interior of descending part of duodenum

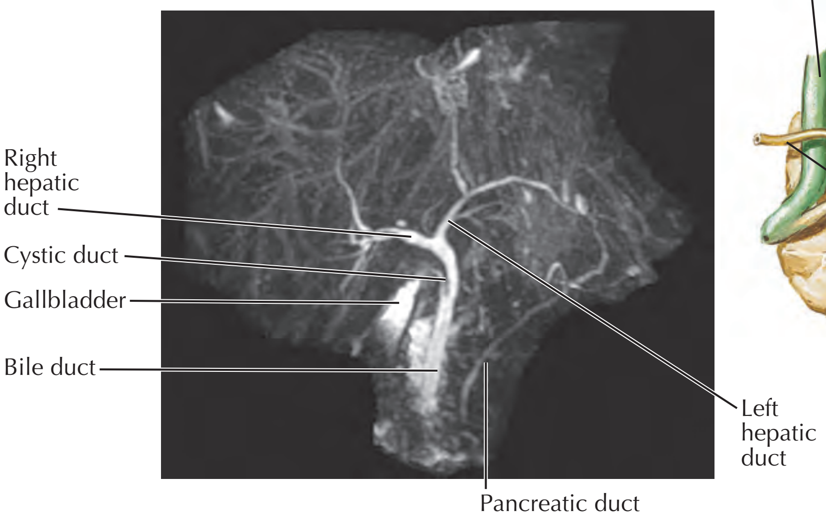

Bile duct
Longitudinal muscular layer of duodenum
Circular muscular layer of duodenum
Pancreatic duct
Sphincter of bile duct
Sphincter of pancreatic duct (inconstant)
Sphincter of hepatopancreatic ampulla

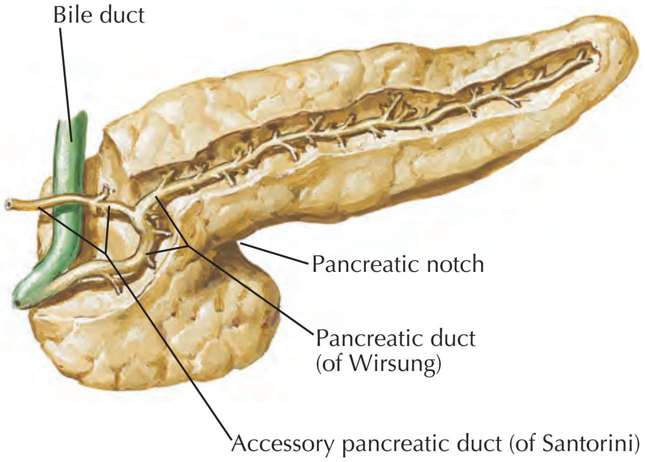
Dissection

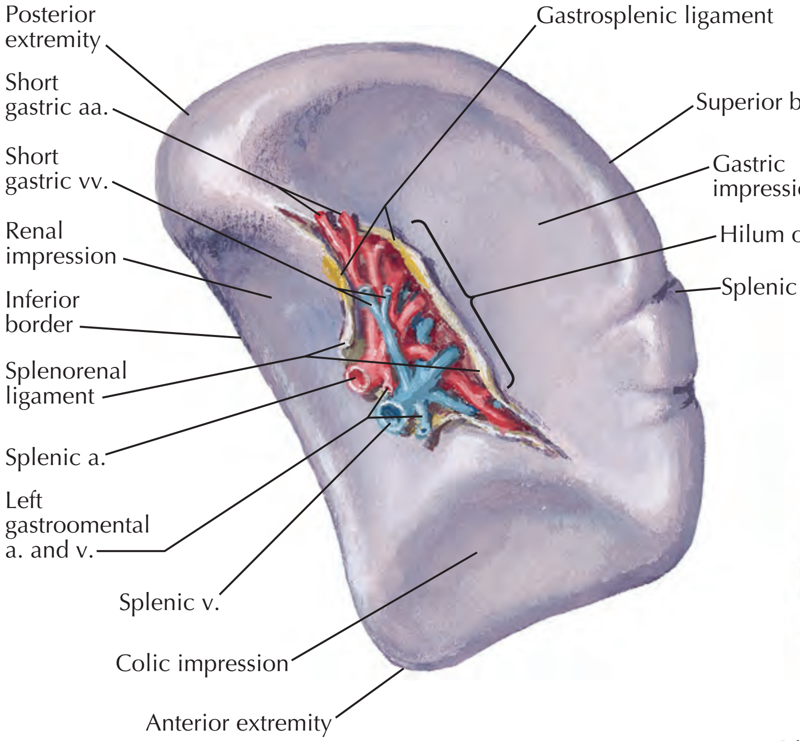
Pancreas in Situ

See also **Plates BP 62, BP 63**

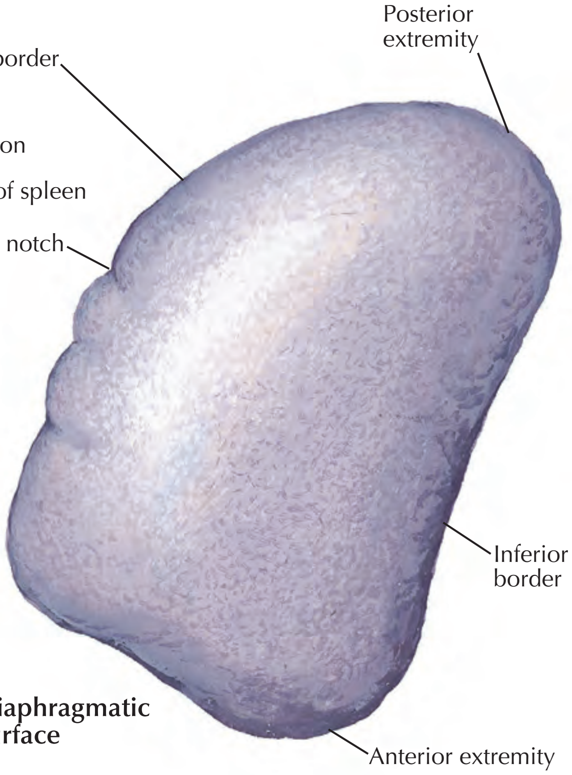

Inferior vena cava
Common hepatic a.
Celiac trunk
Splenic a.
Stomach (*cut*)
Spleen
Portal triad
Hepatic portal v.
Proper hepatic a.
Bile duct
Free margin of lesser omentum
Suprarenal gland
Duodenum
Right kidney
Attachment of transverse mesocolon
Right colic flexure
Transverse colon (*cut*)
Tail of pancreas
Body of pancreas
Neck of pancreas
Head of pancreas
Left colic flexure
Transverse colon (*cut*)
Left kidney
Attachment of transverse mesocolon
Inferior mesenteric v.
Jejunum (*cut*)
Duodenojejunal flexure
Root of mesentery (*cut*)
Middle colic a. and v.
Superior mesenteric a. and v.
Uncinate process of pancreas


Magnetic resonance cholangiopancreatography (MRCP)
Right hepatic duct
Cystic duct
Gallbladder
Bile duct
Left hepatic duct
Pancreatic duct

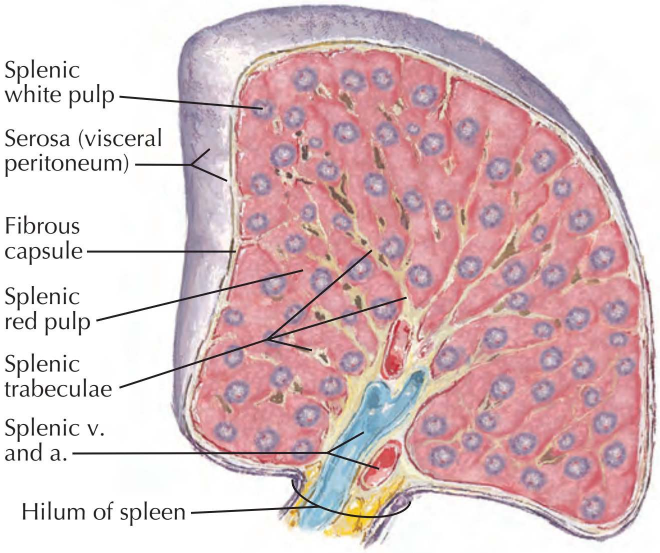

Bile duct
Pancreatic notch
Pancreatic duct (of Wirsung)
Accessory pancreatic duct (of Santorini)


Posterior extremity
Short gastric aa.
Short gastric vv.
Renal impression
Inferior border
Splenorenal ligament
Splenic a.
Left gastroomental a. and v.
Splenic v.
Colic impression
Anterior extremity
Gastrosplenic ligament
Superior border
Gastric impression
Hilum of spleen
Splenic notch

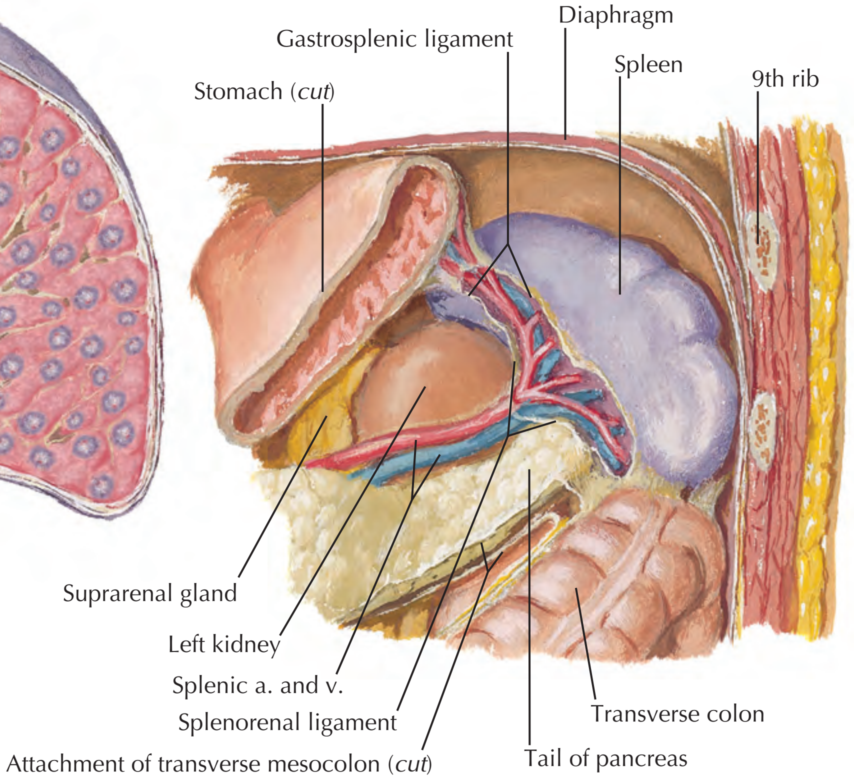
Visceral surface


Posterior extremity
Inferior border
Anterior extremity

Diaphragmatic surface


Splenic white pulp
Serosa (visceral peritoneum)
Fibrous capsule
Splenic red pulp
Splenic trabeculae
Splenic v. and a.
Hilum of spleen

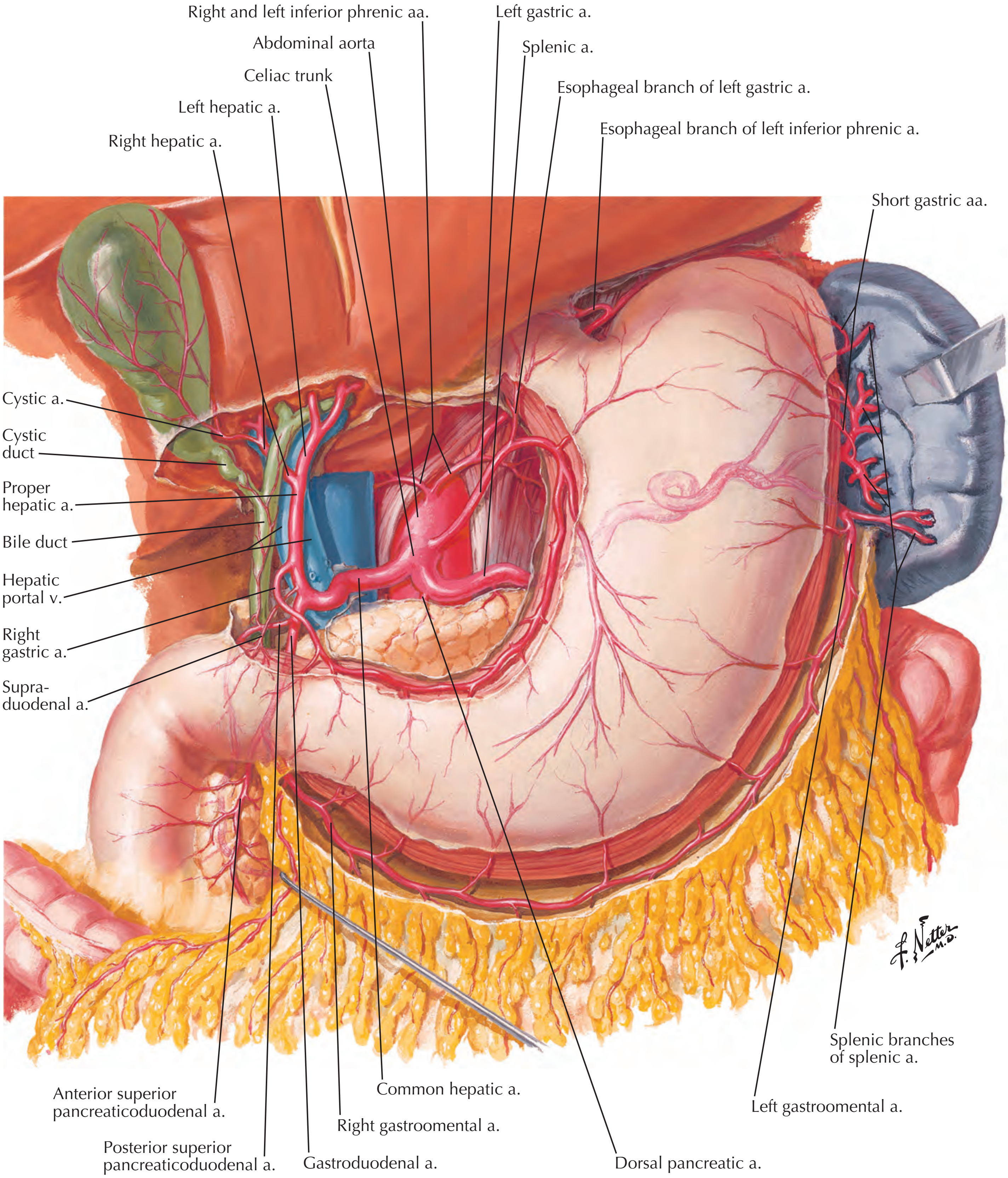
Cross section

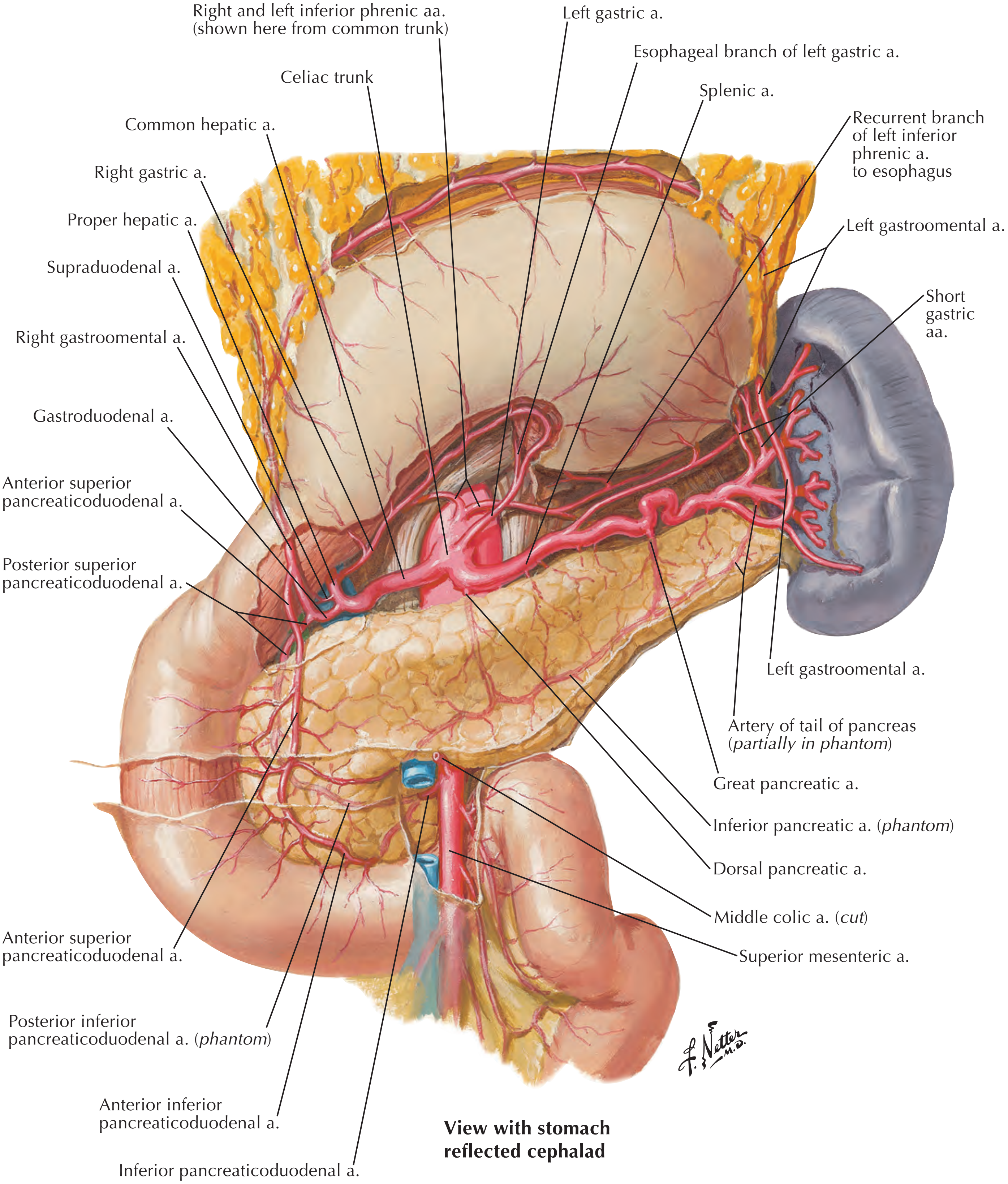

Diaphragm
Gastrosplenic ligament
Spleen
9th rib
Stomach (*cut*)
Suprarenal gland
Left kidney
Splenic a. and v.
Splenorenal ligament
Attachment of transverse mesocolon (*cut*)
Transverse colon
Tail of pancreas

Spleen in situ

Arteries of Stomach, Liver, and Spleen

See also **Plates BP 64, BP 65, BP 67**

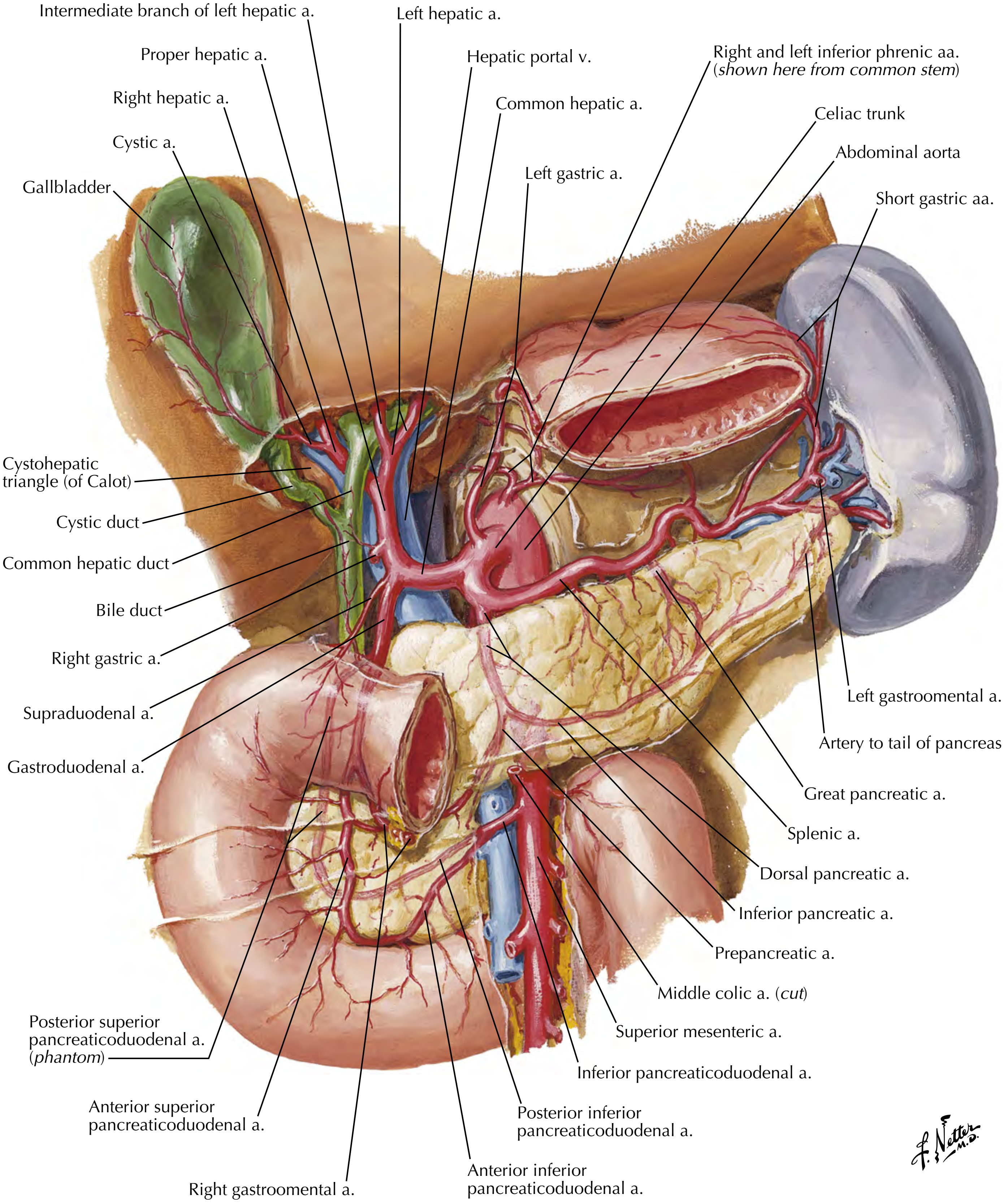

Right and left inferior phrenic aa.
Left gastric a.
Abdominal aorta
Splenic a.
Celiac trunk
Esophageal branch of left gastric a.
Left hepatic a.
Esophageal branch of left inferior phrenic a.
Right hepatic a.
Short gastric aa.
Cystic a.
Cystic duct
Proper hepatic a.
Bile duct
Hepatic portal v.
Right gastric a.
Supraduodenal a.
Splenic branches of splenic a.
Anterior superior pancreaticoduodenal a.
Common hepatic a.
Left gastroomental a.
Right gastroomental a.
Posterior superior pancreaticoduodenal a.
Gastroduodenal a.
Dorsal pancreatic a.


Right and left inferior phrenic aa.
(shown here from common trunk)
Left gastric a.
Esophageal branch of left gastric a.
Celiac trunk
Splenic a.
Common hepatic a.
Recurrent branch of left inferior phrenic a. to esophagus
Right gastric a.
Left gastroomental a.
Proper hepatic a.
Supraduodenal a.
Short gastric aa.
Right gastroomental a.
Gastroduodenal a.
Anterior superior pancreaticoduodenal a.
Posterior superior pancreaticoduodenal a.
Left gastroomental a.
Artery of tail of pancreas (*partially in phantom*)
Great pancreatic a.
Inferior pancreatic a. (*phantom*)
Dorsal pancreatic a.
Middle colic a. (*cut*)
Superior mesenteric a.
Anterior superior pancreaticoduodenal a.
Posterior inferior pancreaticoduodenal a. (*phantom*)
Anterior inferior pancreaticoduodenal a.
Inferior pancreaticoduodenal a.
F. Netter M.D.

View with stomach reflected cephalad

Arteries of Liver, Pancreas, Duodenum, and Spleen

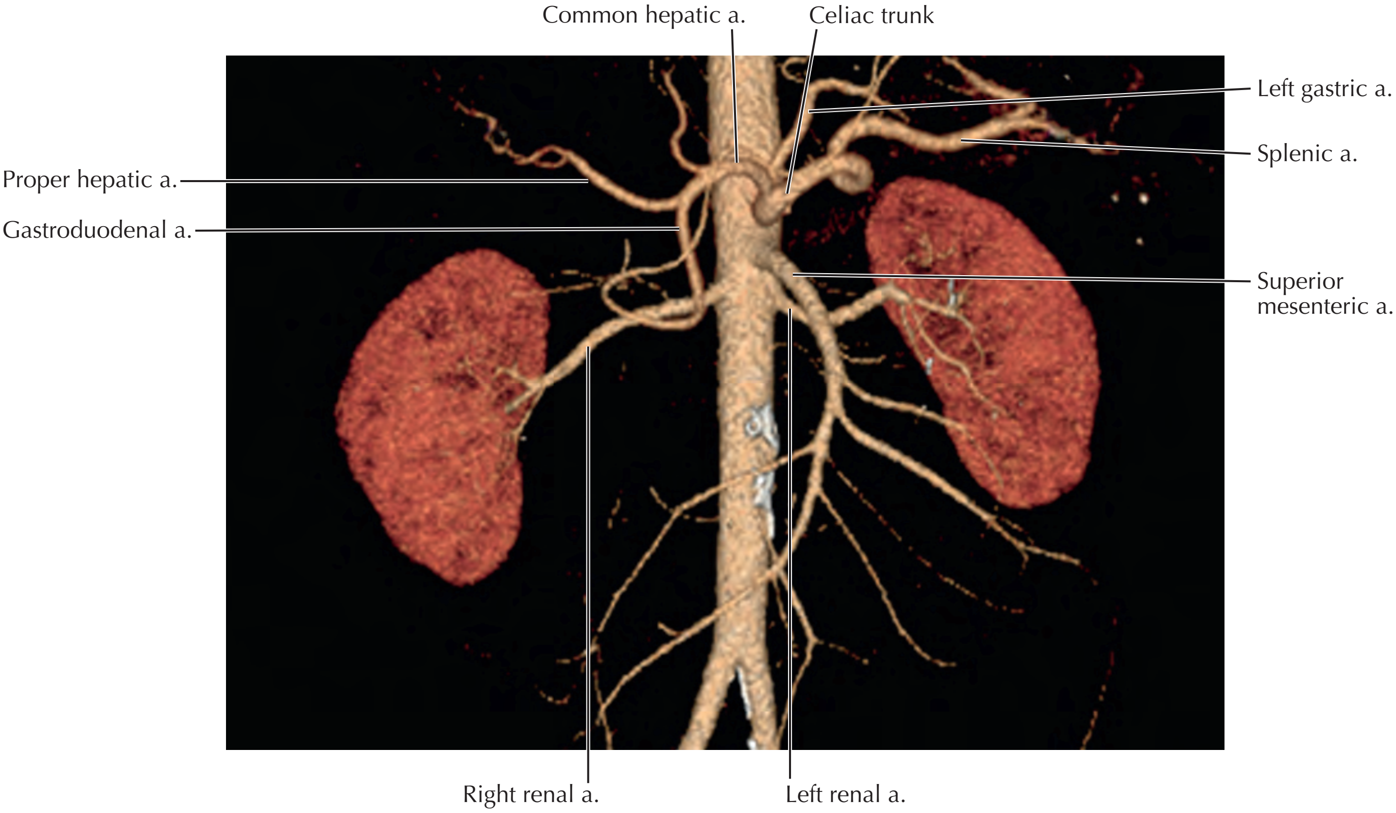
See also **Plates BP 64, BP 65, BP 67**



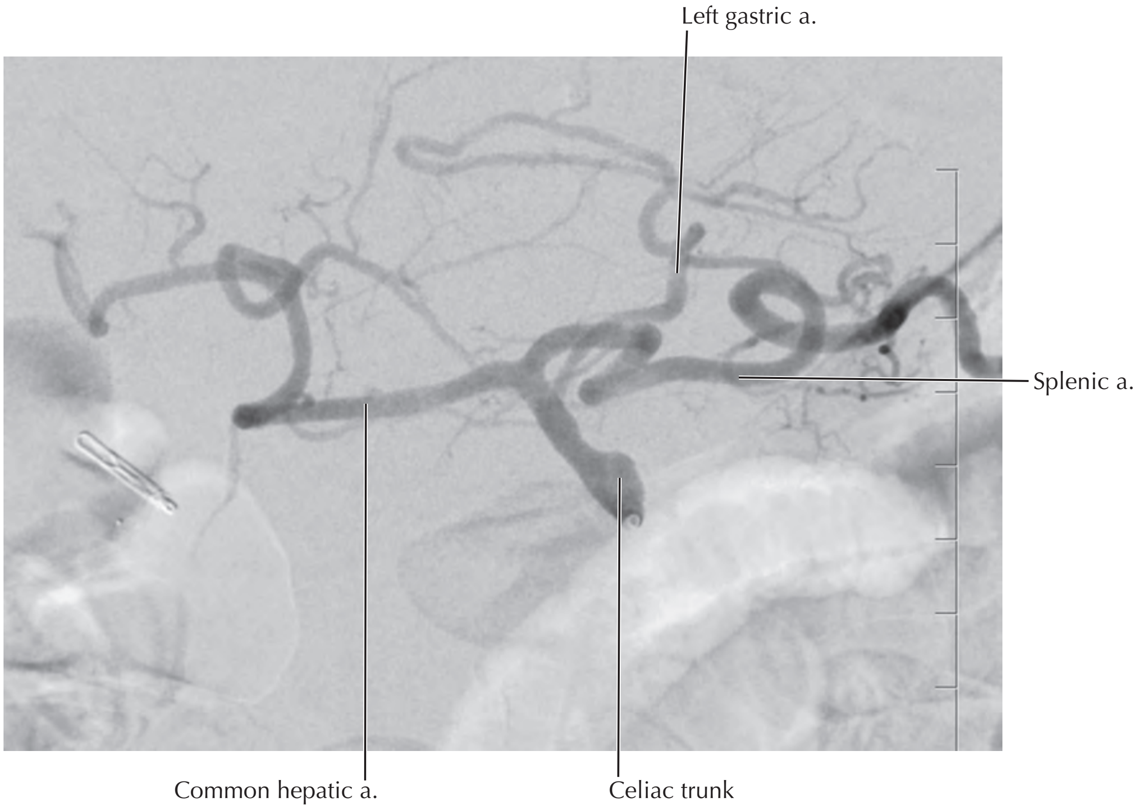
Intermediate branch of left hepatic a.
Left hepatic a.
Proper hepatic a.
Hepatic portal v.
Right and left inferior phrenic aa. (*shown here from common stem*)
Right hepatic a.
Common hepatic a.
Celiac trunk
Cystic a.
Abdominal aorta
Left gastric a.
Gallbladder
Short gastric aa.
Cystohepatic triangle (of Calot)
Cystic duct
Common hepatic duct
Bile duct
Right gastric a.
Supraduodenal a.
Gastroduodenal a.
Left gastroomental a.
Artery to tail of pancreas
Great pancreatic a.
Splenic a.
Dorsal pancreatic a.
Inferior pancreatic a.
Prepancreatic a.
Middle colic a. (*cut*)
Superior mesenteric a.
Posterior superior pancreaticoduodenal a. (*phantom*)
Inferior pancreaticoduodenal a.
Anterior superior pancreaticoduodenal a.
Posterior inferior pancreaticoduodenal a.
Anterior inferior pancreaticoduodenal a.
Right gastroomental a.
F. Netter M.D.

See also **Plates 308, 310**

3D volume-rendered CT image with intravenous contrast enhancement

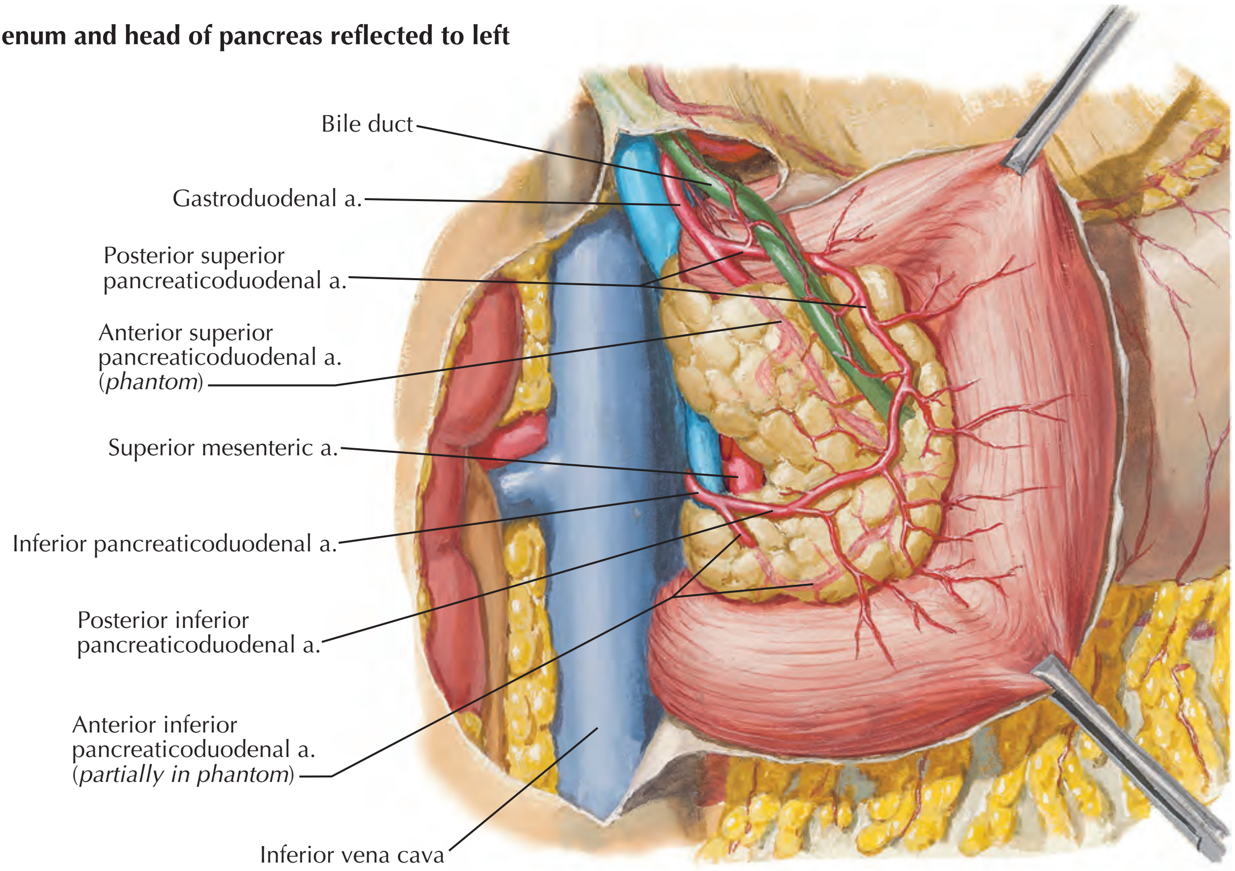

Common hepatic a.
Celiac trunk
Left gastric a.
Splenic a.
Proper hepatic a.
Gastroduodenal a.
Superior mesenteric a.
Right renal a.
Left renal a.

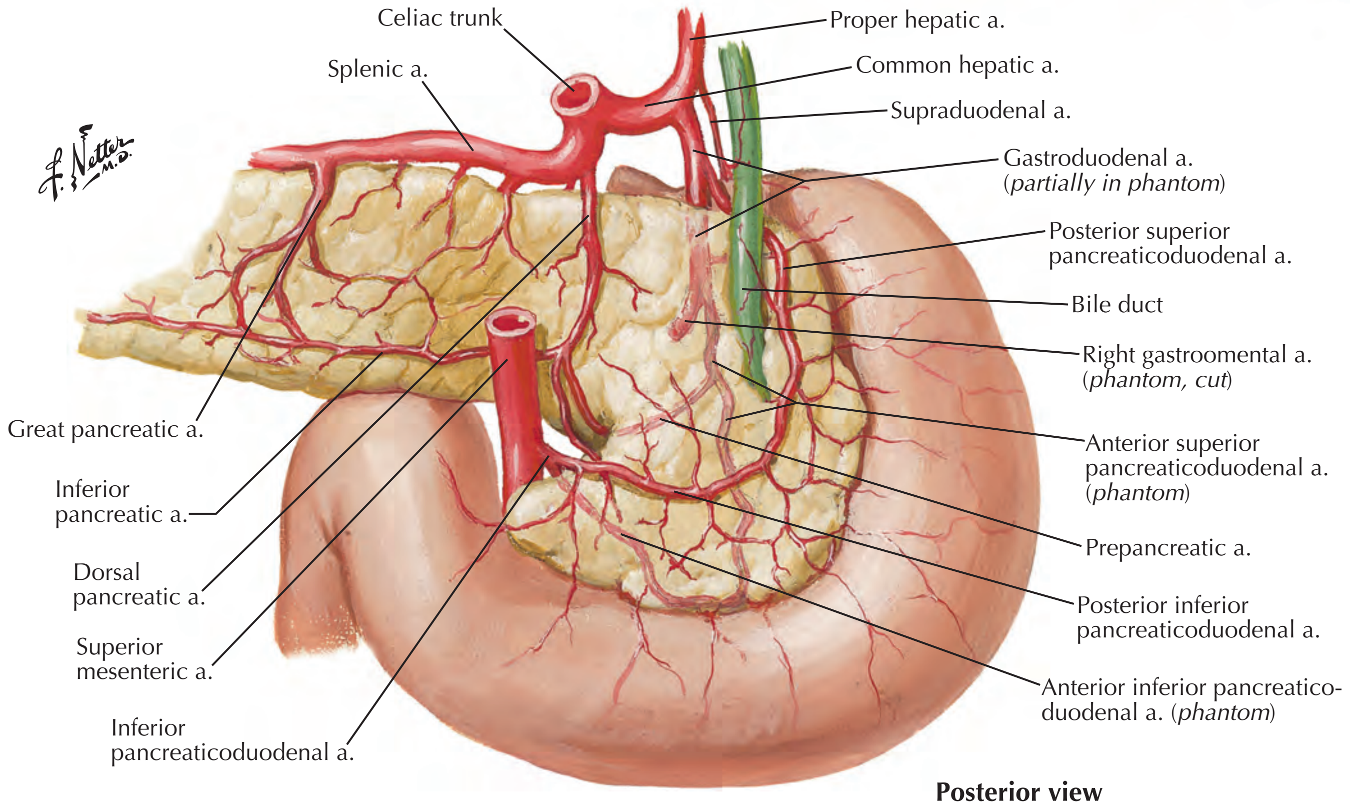
Selective digital subtraction angiogram, celiac trunk


Left gastric a.
Splenic a.
Common hepatic a.
Celiac trunk

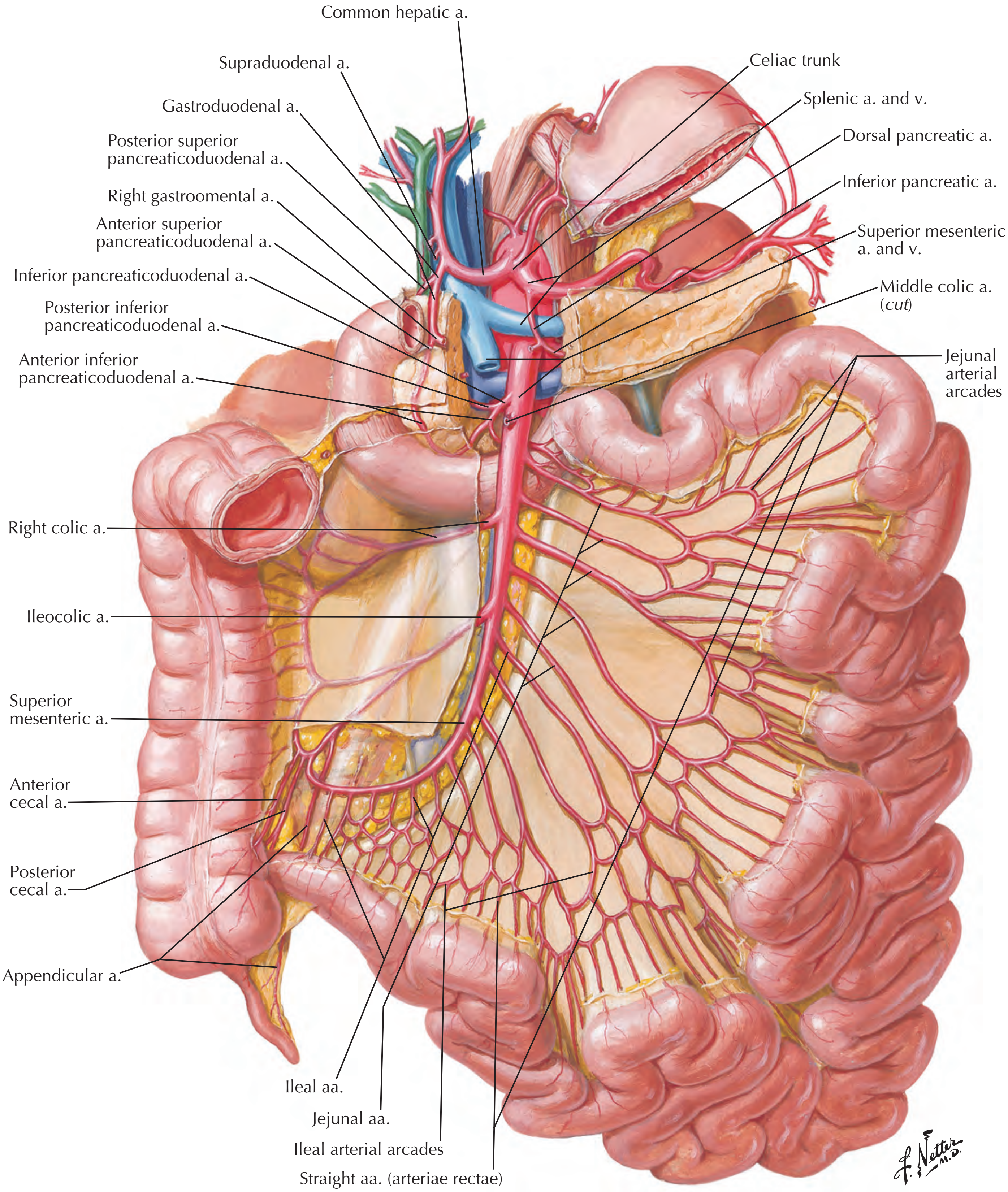
Arteries of Duodenum and Head of Pancreas

Duodenum and head of pancreas reflected to left


Bile duct
Gastroduodenal a.
Posterior superior pancreaticoduodenal a.
Anterior superior pancreaticoduodenal a. (*phantom*)
Superior mesenteric a.
Inferior pancreaticoduodenal a.
Posterior inferior pancreaticoduodenal a.
Anterior inferior pancreaticoduodenal a. (*partially in phantom*)
Inferior vena cava

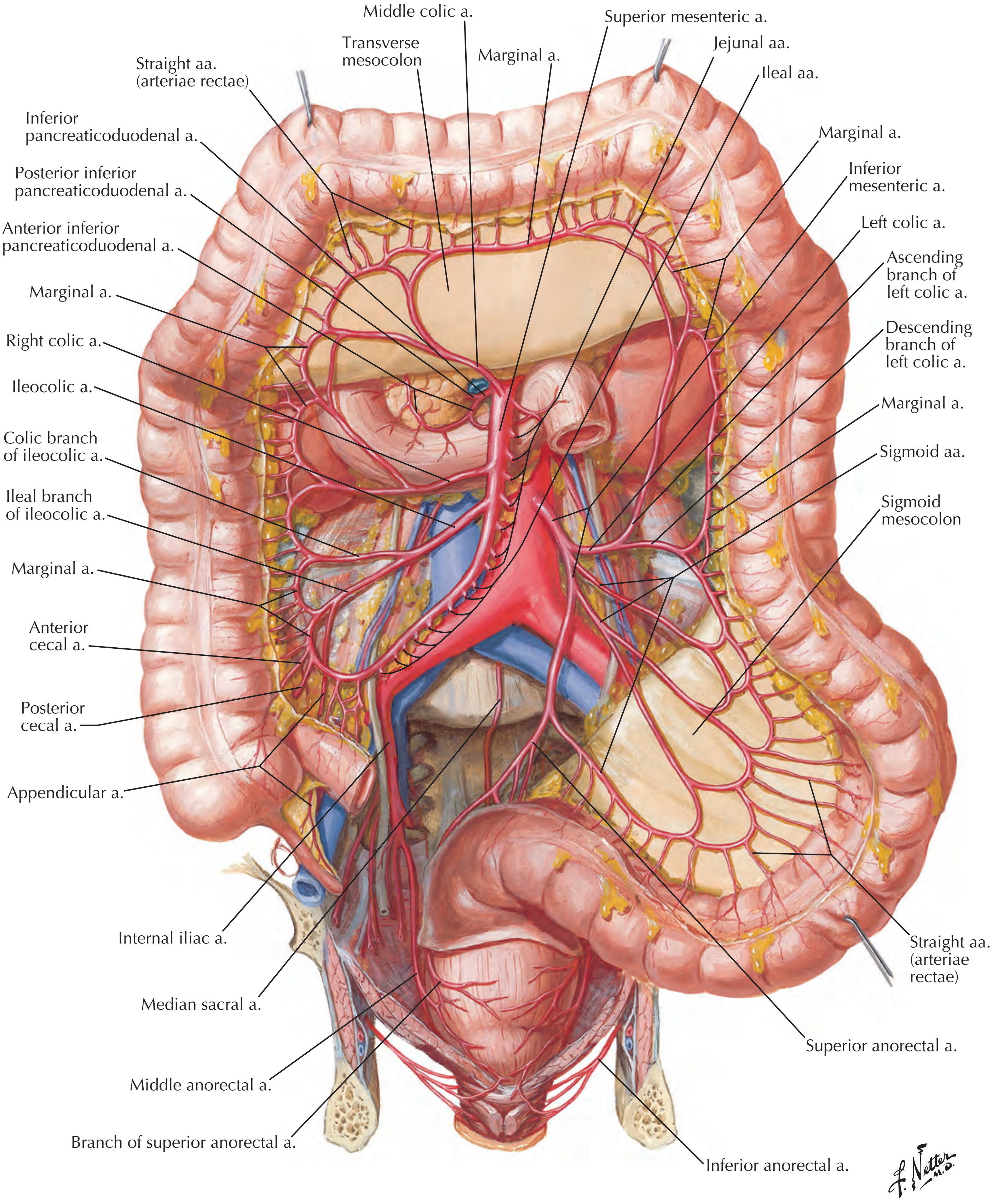

Celiac trunk
Splenic a.
Proper hepatic a.
Common hepatic a.
Supraduodenal a.
Gastroduodenal a. (*partially in phantom*)
Posterior superior pancreaticoduodenal a.
Bile duct
Right gastroomental a. (*phantom, cut*)
Anterior superior pancreaticoduodenal a. (*phantom*)
Prepancreatic a.
Posterior inferior pancreaticoduodenal a.
Anterior inferior pancreaticoduodenal a. (*phantom*)
Great pancreatic a.
Inferior pancreatic a.
Dorsal pancreatic a.
Superior mesenteric a.
Inferior pancreaticoduodenal a.

Posterior view


Common hepatic a.
Supraduodenal a.
Gastroduodenal a.
Posterior superior pancreaticoduodenal a.
Right gastroomental a.
Anterior superior pancreaticoduodenal a.
Inferior pancreaticoduodenal a.
Posterior inferior pancreaticoduodenal a.
Anterior inferior pancreaticoduodenal a.
Right colic a.
Ileocolic a.
Superior mesenteric a.
Anterior cecal a.
Posterior cecal a.
Appendicular a.
Ileal aa.
Jejunal aa.
Ileal arterial arcades
Straight aa. (arteriae rectae)
Celiac trunk
Splenic a. and v.
Dorsal pancreatic a.
Inferior pancreatic a.
Superior mesenteric a. and v.
Middle colic a. (*cut*)
Jejunal arterial arcades
F. Netter M.D.

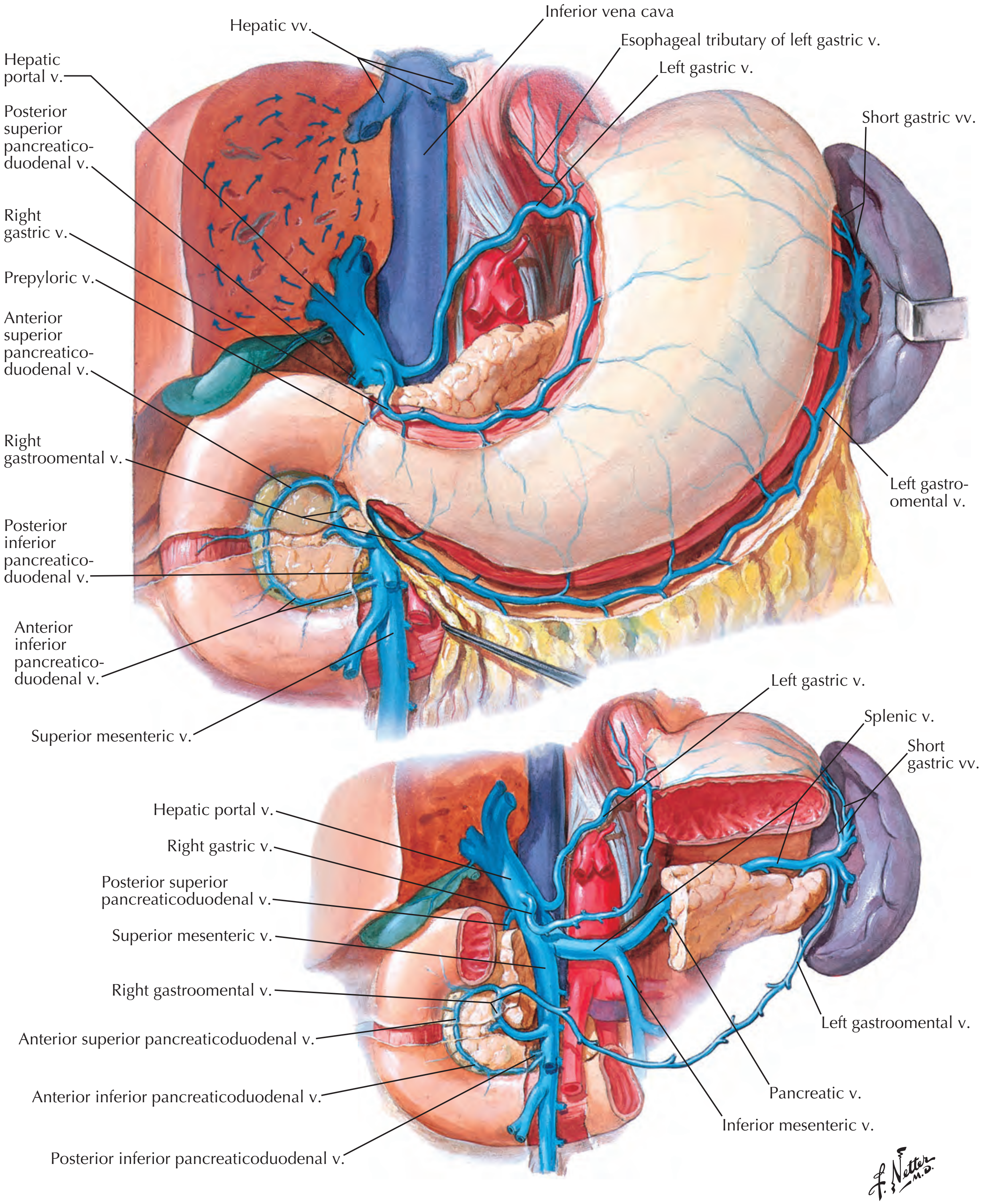
Arteries of Large Intestine

See also **Plates 400, BP 61, BP 68, BP 69**


Middle colic a.
Transverse mesocolon
Marginal a.
Superior mesenteric a.
Jejunal aa.
Ileal aa.
Straight aa. (arteriae rectae)
Inferior pancreaticoduodenal a.
Posterior inferior pancreaticoduodenal a.
Anterior inferior pancreaticoduodenal a.
Marginal a.
Inferior mesenteric a.
Left colic a.
Ascending branch of left colic a.
Marginal a.
Right colic a.
Descending branch of left colic a.
Ileocolic a.
Marginal a.
Colic branch of ileocolic a.
Sigmoid aa.
Ileal branch of ileocolic a.
Sigmoid mesocolon
Marginal a.
Anterior cecal a.
Posterior cecal a.
Appendicular a.
Internal iliac a.
Straight aa. (arteriae rectae)
Median sacral a.
Superior anorectal a.
Middle anorectal a.
Branch of superior anorectal a.
Inferior anorectal a.
F. Netter M.D.

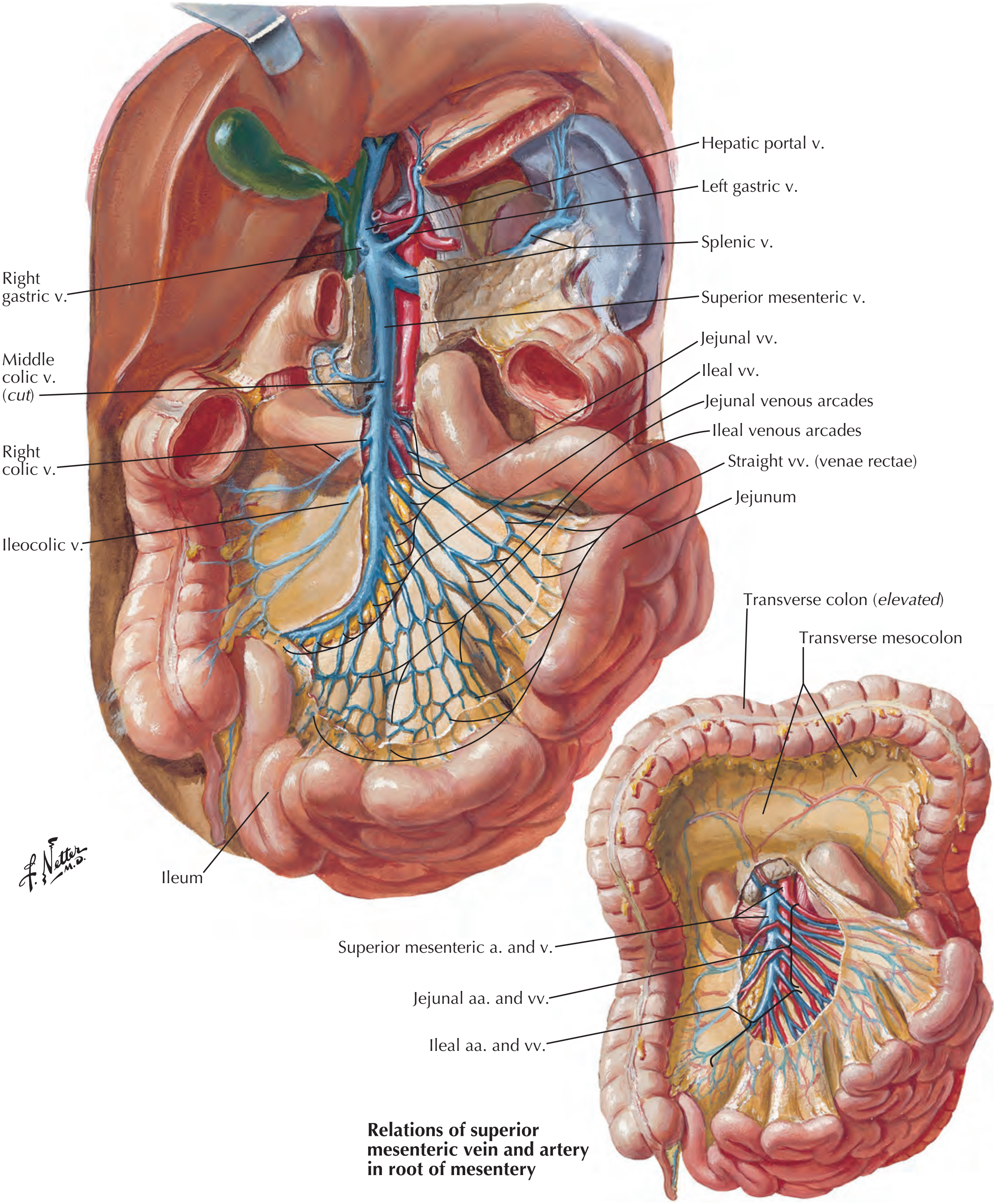
Veins of Stomach, Duodenum, Pancreas, and Spleen

See also **Plates BP 66, BP 74, BP 75, BP 78**


Hepatic vv.
Inferior vena cava
Esophageal tributary of left gastric v.
Left gastric v.
Hepatic portal v.
Posterior superior pancreaticoduodenal v.
Short gastric vv.
Right gastric v.
Prepyloric v.
Anterior superior pancreaticoduodenal v.
Right gastroomental v.
Left gastroomental v.
Posterior inferior pancreaticoduodenal v.
Anterior inferior pancreaticoduodenal v.
Superior mesenteric v.
Left gastric v.
Splenic v.
Short gastric vv.
Hepatic portal v.
Right gastric v.
Posterior superior pancreaticoduodenal v.
Superior mesenteric v.
Right gastroomental v.
Anterior superior pancreaticoduodenal v.
Left gastroomental v.
Anterior inferior pancreaticoduodenal v.
Pancreatic v.
Inferior mesenteric v.
Posterior inferior pancreaticoduodenal v.

Veins of Small Intestine

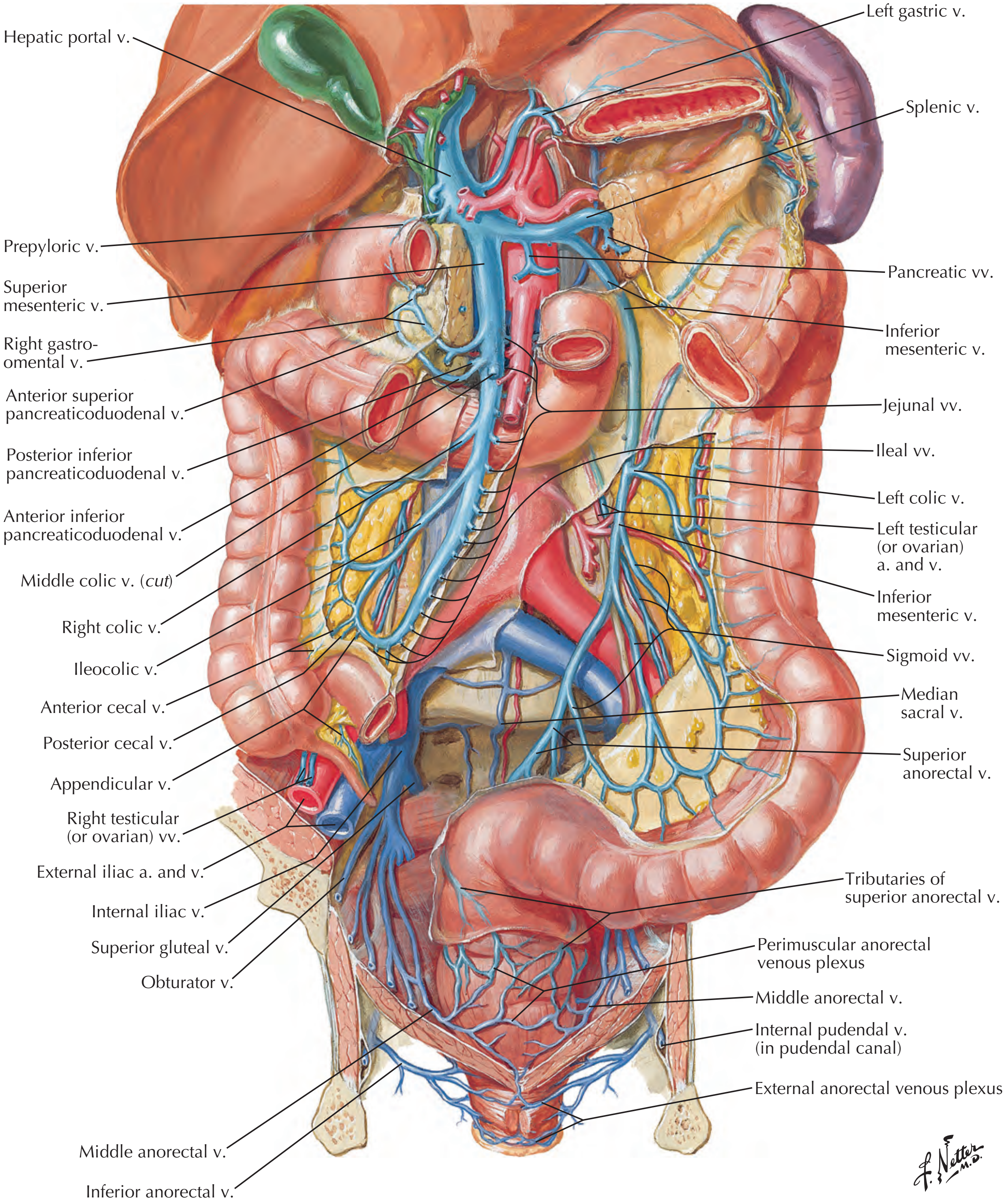
See also **Plate BP 76**


Hepatic portal v.
Left gastric v.
Splenic v.
Superior mesenteric v.
Jejunal vv.
Ileal vv.
Jejunal venous arcades
Ileal venous arcades
Straight vv. (venae rectae)
Jejunum
Right gastric v.
Middle colic v. (*cut*)
Right colic v.
Ileocolic v.
Ileum
Transverse colon (*elevated*)
Transverse mesocolon
Superior mesenteric a. and v.
Jejunal aa. and vv.
Ileal aa. and vv.

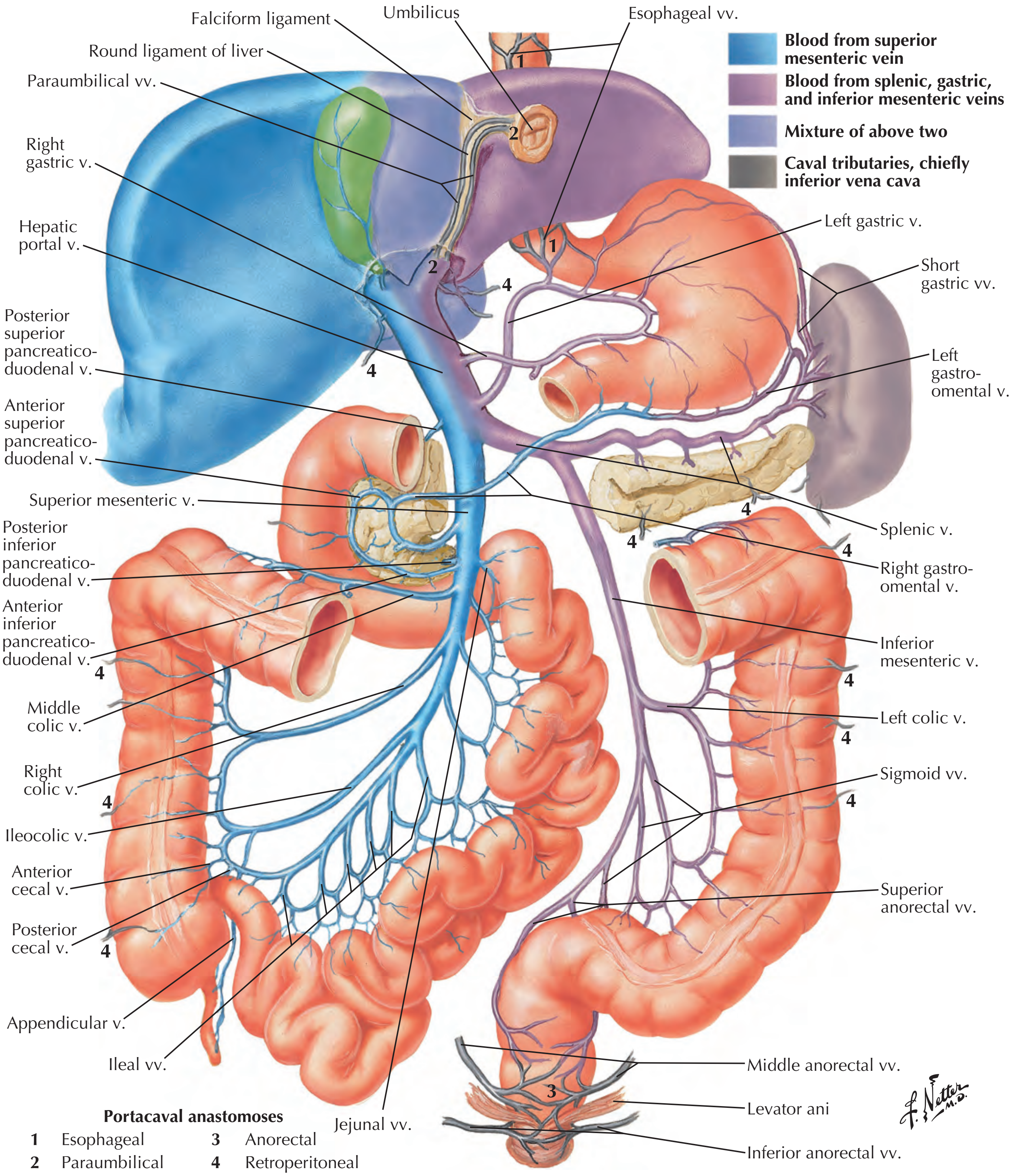
Relations of superior mesenteric vein and artery in root of mesentery

Veins of Large Intestine

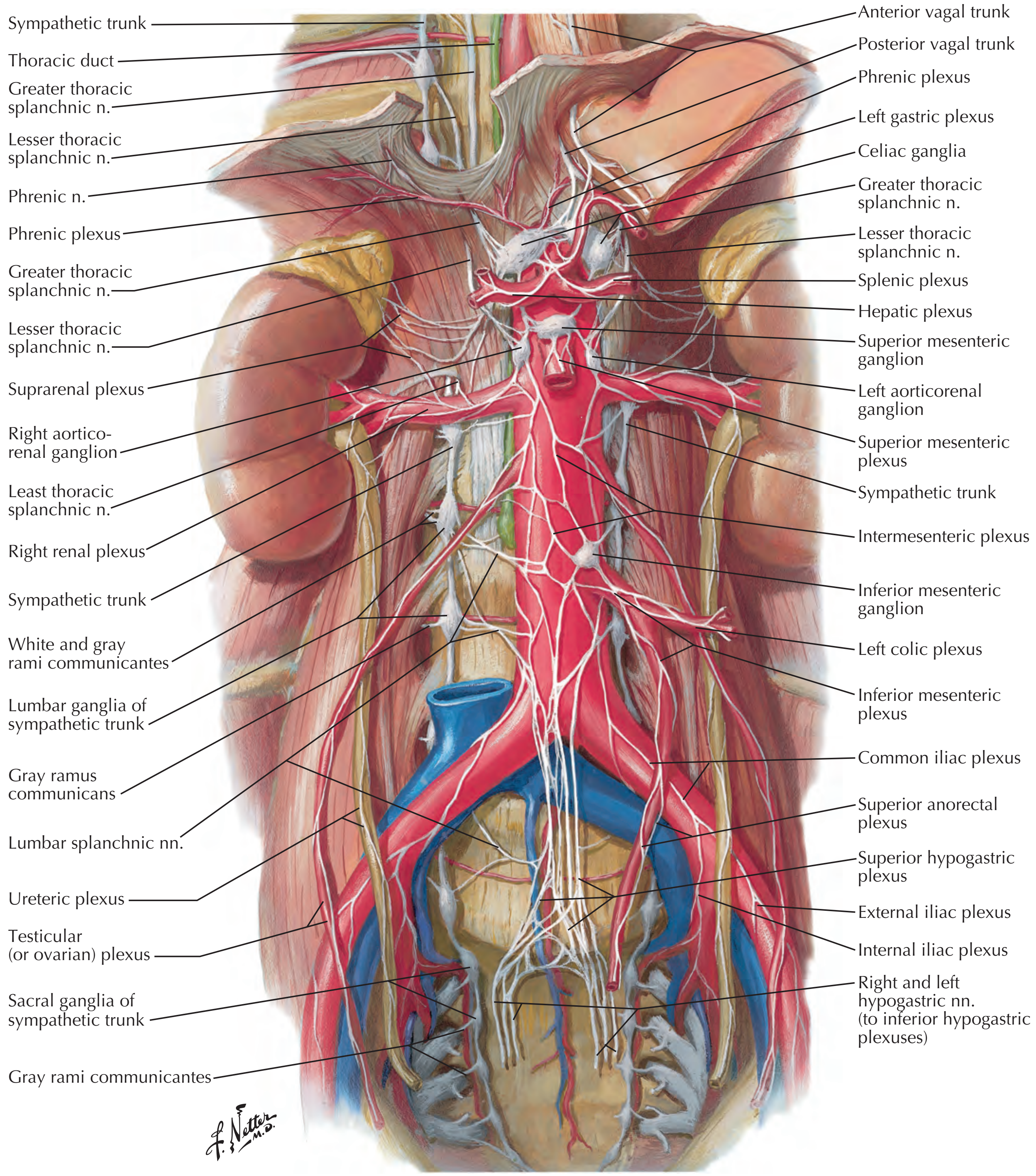
See also **Plates 401, BP 77**


Hepatic portal v.
Prepyloric v.
Superior mesenteric v.
Right gastro-omental v.
Anterior superior pancreaticoduodenal v.
Posterior inferior pancreaticoduodenal v.
Anterior inferior pancreaticoduodenal v.
Middle colic v. (*cut*)
Right colic v.
Ileocolic v.
Anterior cecal v.
Posterior cecal v.
Appendicular v.
Right testicular (or ovarian) vv.
External iliac a. and v.
Internal iliac v.
Superior gluteal v.
Obturator v.
Middle anorectal v.
Inferior anorectal v.
Left gastric v.
Splenic v.
Pancreatic vv.
Inferior mesenteric v.
Jejunal vv.
Ileal vv.
Left colic v.
Left testicular (or ovarian) a. and v.
Inferior mesenteric v.
Sigmoid vv.
Median sacral v.
Superior anorectal v.
Tributaries of superior anorectal v.
Perimuscular anorectal venous plexus
Middle anorectal v.
Internal pudendal v. (in pudendal canal)
External anorectal venous plexus
F. Netter M.D.

Hepatic Portal Vein, Tributaries and Portacaval Anastomoses

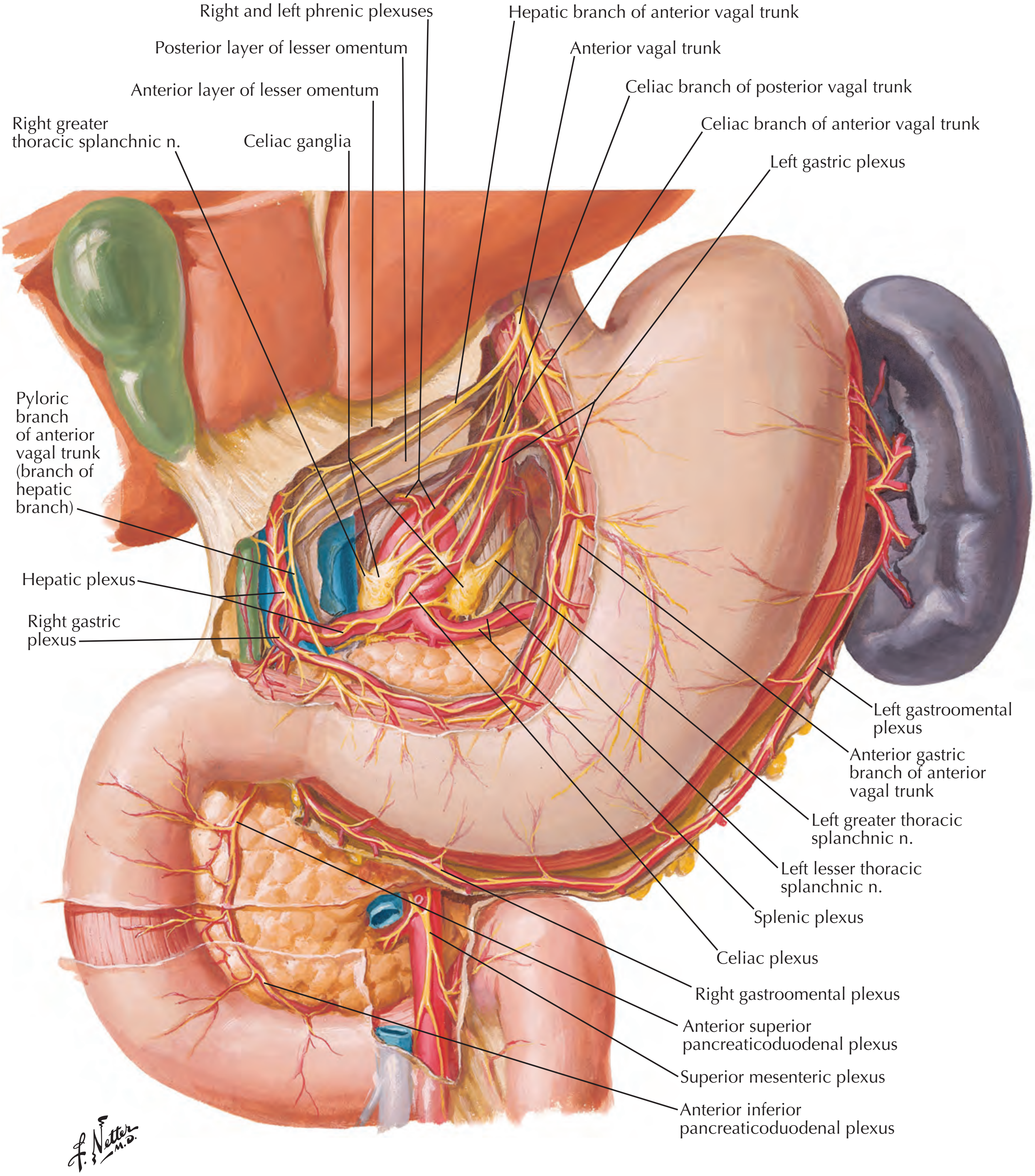

Falciform ligament
Umbilicus
Esophageal vv.
Round ligament of liver
Paraumbilical vv.
Right gastric v.
Hepatic portal v.
Posterior superior pancreaticoduodenal v.
Anterior superior pancreaticoduodenal v.
Superior mesenteric v.
Posterior inferior pancreaticoduodenal v.
Anterior inferior pancreaticoduodenal v.
Middle colic v.
Right colic v.
Ileocolic v.
Anterior cecal v.
Posterior cecal v.
Appendicular v.
Ileal vv.
Jejunal vv.
Blood from superior mesenteric vein
Blood from splenic, gastric, and inferior mesenteric veins
Mixture of above two
Caval tributaries, chiefly inferior vena cava
Left gastric v.
Short gastric vv.
Left gastro-omental v.
Splenic v.
Right gastro-omental v.
Inferior mesenteric v.
Left colic v.
Sigmoid vv.
Superior anorectal vv.
Middle anorectal vv.
Levator ani
Inferior anorectal vv.
1
2
3
4
Portacaval anastomoses
1 Esophageal
2 Paraumbilical
3 Anorectal
4 Retroperitoneal

See also **Plate 323**


Sympathetic trunk
Thoracic duct
Greater thoracic splanchnic n.
Lesser thoracic splanchnic n.
Phrenic n.
Phrenic plexus
Greater thoracic splanchnic n.
Lesser thoracic splanchnic n.
Suprarenal plexus
Right aortico-renal ganglion
Least thoracic splanchnic n.
Right renal plexus
Sympathetic trunk
White and gray rami communicantes
Lumbar ganglia of sympathetic trunk
Gray ramus communicans
Lumbar splanchnic nn.
Ureteric plexus
Testicular (or ovarian) plexus
Sacral ganglia of sympathetic trunk
Gray rami communicantes
Anterior vagal trunk
Posterior vagal trunk
Phrenic plexus
Left gastric plexus
Celiac ganglia
Greater thoracic splanchnic n.
Lesser thoracic splanchnic n.
Splenic plexus
Hepatic plexus
Superior mesenteric ganglion
Left aorticorenal ganglion
Superior mesenteric plexus
Sympathetic trunk
Intermesenteric plexus
Inferior mesenteric ganglion
Left colic plexus
Inferior mesenteric plexus
Common iliac plexus
Superior anorectal plexus
Superior hypogastric plexus
External iliac plexus
Internal iliac plexus
Right and left hypogastric nn. (to inferior hypogastric plexuses)
F. Netter M.D.

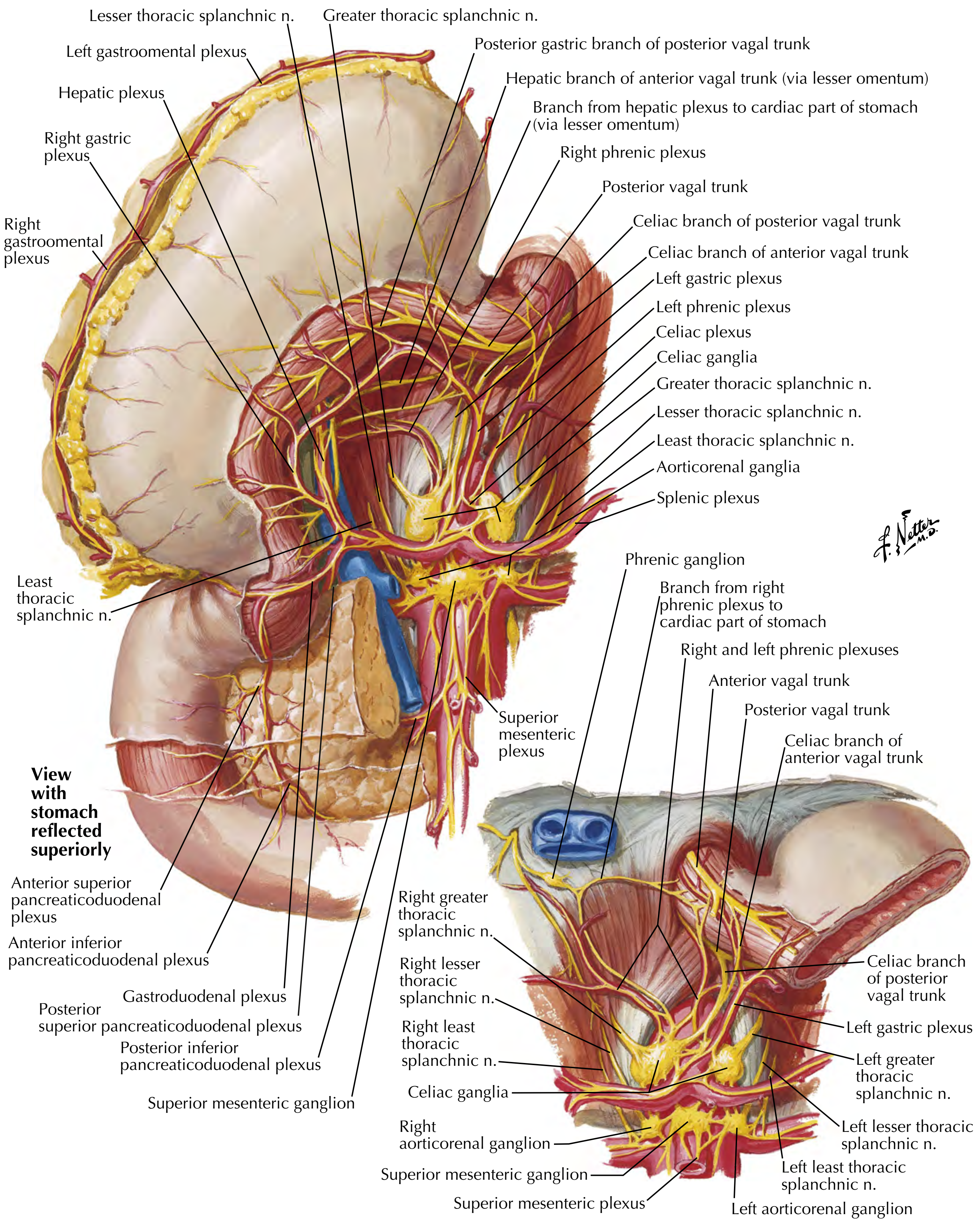
Autonomic Innervation of Stomach and Duodenum

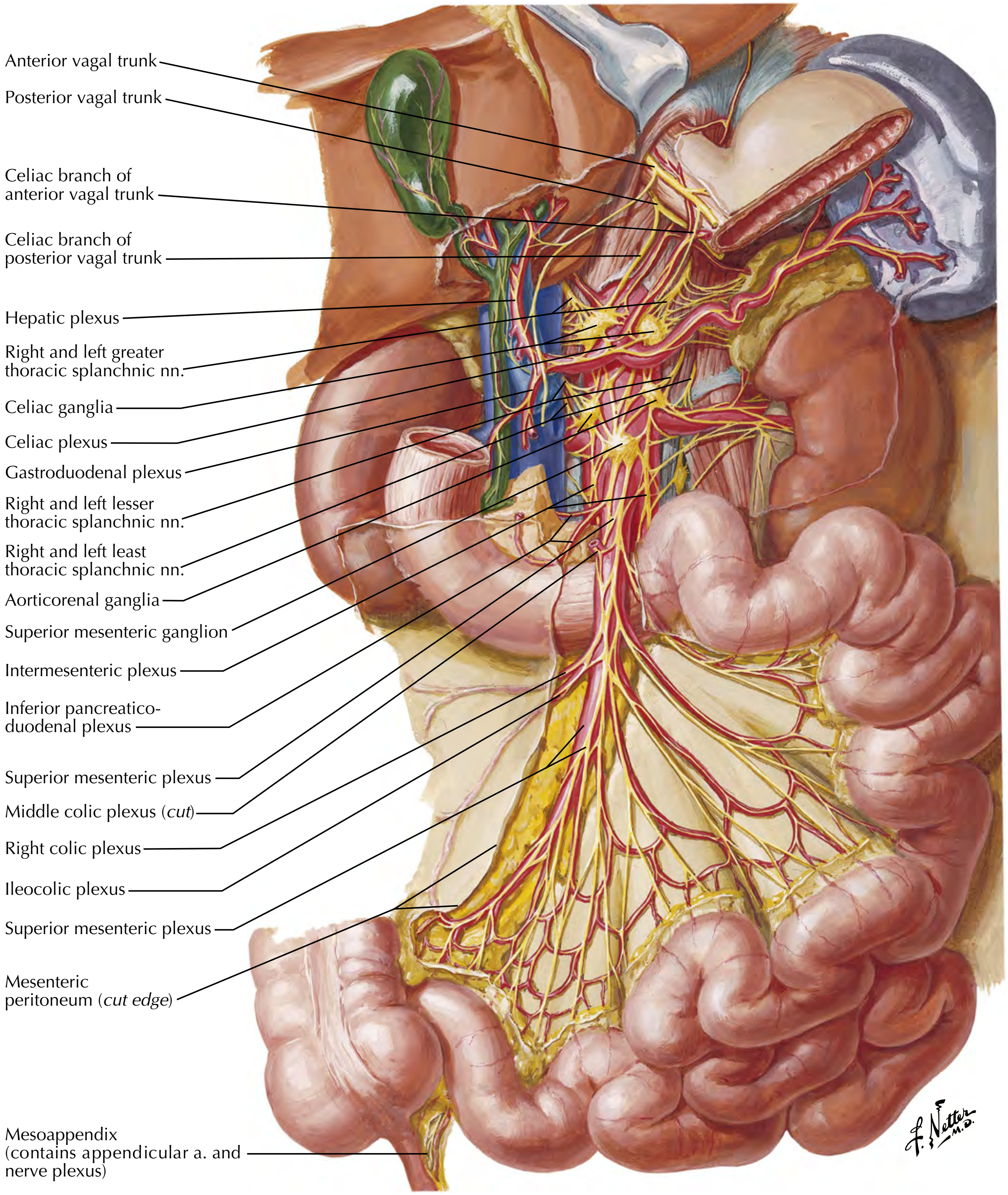
See also **Plate 261**



Right and left phrenic plexuses
Hepatic branch of anterior vagal trunk
Posterior layer of lesser omentum
Anterior vagal trunk
Anterior layer of lesser omentum
Celiac branch of posterior vagal trunk
Celiac branch of anterior vagal trunk
Right greater thoracic splanchnic n.
Celiac ganglia
Left gastric plexus
Pyloric branch of anterior vagal trunk (branch of hepatic branch)
Hepatic plexus
Right gastric plexus
Left gastroomental plexus
Anterior gastric branch of anterior vagal trunk
Left greater thoracic splanchnic n.
Left lesser thoracic splanchnic n.
Splenic plexus
Celiac plexus
Right gastroomental plexus
Anterior superior pancreaticoduodenal plexus
Superior mesenteric plexus
Anterior inferior pancreaticoduodenal plexus
F. Netter M.D.

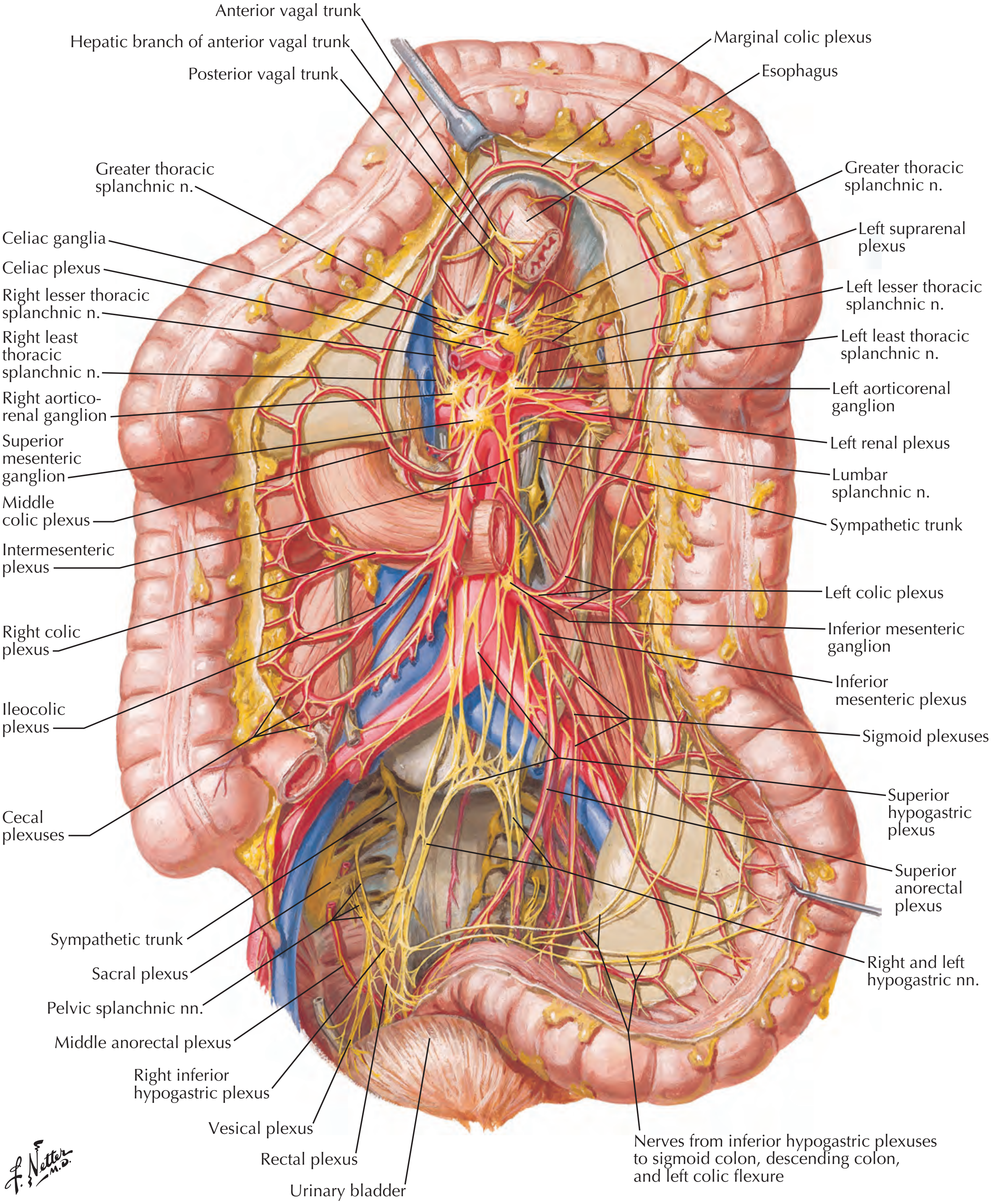
Autonomic Innervation of Stomach and Duodenum (Continued)


Lesser thoracic splanchnic n.
Greater thoracic splanchnic n.
Left gastroomental plexus
Posterior gastric branch of posterior vagal trunk
Hepatic plexus
Hepatic branch of anterior vagal trunk (via lesser omentum)
Branch from hepatic plexus to cardiac part of stomach (via lesser omentum)
Right gastric plexus
Right phrenic plexus
Posterior vagal trunk
Right gastroomental plexus
Celiac branch of posterior vagal trunk
Celiac branch of anterior vagal trunk
Left gastric plexus
Left phrenic plexus
Celiac plexus
Celiac ganglia
Greater thoracic splanchnic n.
Lesser thoracic splanchnic n.
Least thoracic splanchnic n.
Aorticorenal ganglia
Splenic plexus
F. Netter M.D.
Least thoracic splanchnic n.
Phrenic ganglion
Branch from right phrenic plexus to cardiac part of stomach
Right and left phrenic plexuses
Anterior vagal trunk
Posterior vagal trunk
Superior mesenteric plexus
Celiac branch of anterior vagal trunk
View with stomach reflected superiorly
Anterior superior pancreaticoduodenal plexus
Right greater thoracic splanchnic n.
Anterior inferior pancreaticoduodenal plexus
Right lesser thoracic splanchnic n.
Celiac branch of posterior vagal trunk
Gastroduodenal plexus
Left gastric plexus
Posterior superior pancreaticoduodenal plexus
Right least thoracic splanchnic n.
Left greater thoracic splanchnic n.
Posterior inferior pancreaticoduodenal plexus
Celiac ganglia
Superior mesenteric ganglion
Right aorticorenal ganglion
Left lesser thoracic splanchnic n.
Left least thoracic splanchnic n.
Superior mesenteric ganglion
Superior mesenteric plexus
Left aorticorenal ganglion


Anterior vagal trunk
Posterior vagal trunk
Celiac branch of anterior vagal trunk
Celiac branch of posterior vagal trunk
Hepatic plexus
Right and left greater thoracic splanchnic nn.
Celiac ganglia
Celiac plexus
Gastroduodenal plexus
Right and left lesser thoracic splanchnic nn.
Right and left least thoracic splanchnic nn.
Aorticorenal ganglia
Superior mesenteric ganglion
Intermesenteric plexus
Inferior pancreatico-duodenal plexus
Superior mesenteric plexus
Middle colic plexus (*cut*)
Right colic plexus
Ileocolic plexus
Superior mesenteric plexus
Mesenteric peritoneum (*cut edge*)
Mesoappendix (contains appendicular a. and nerve plexus)

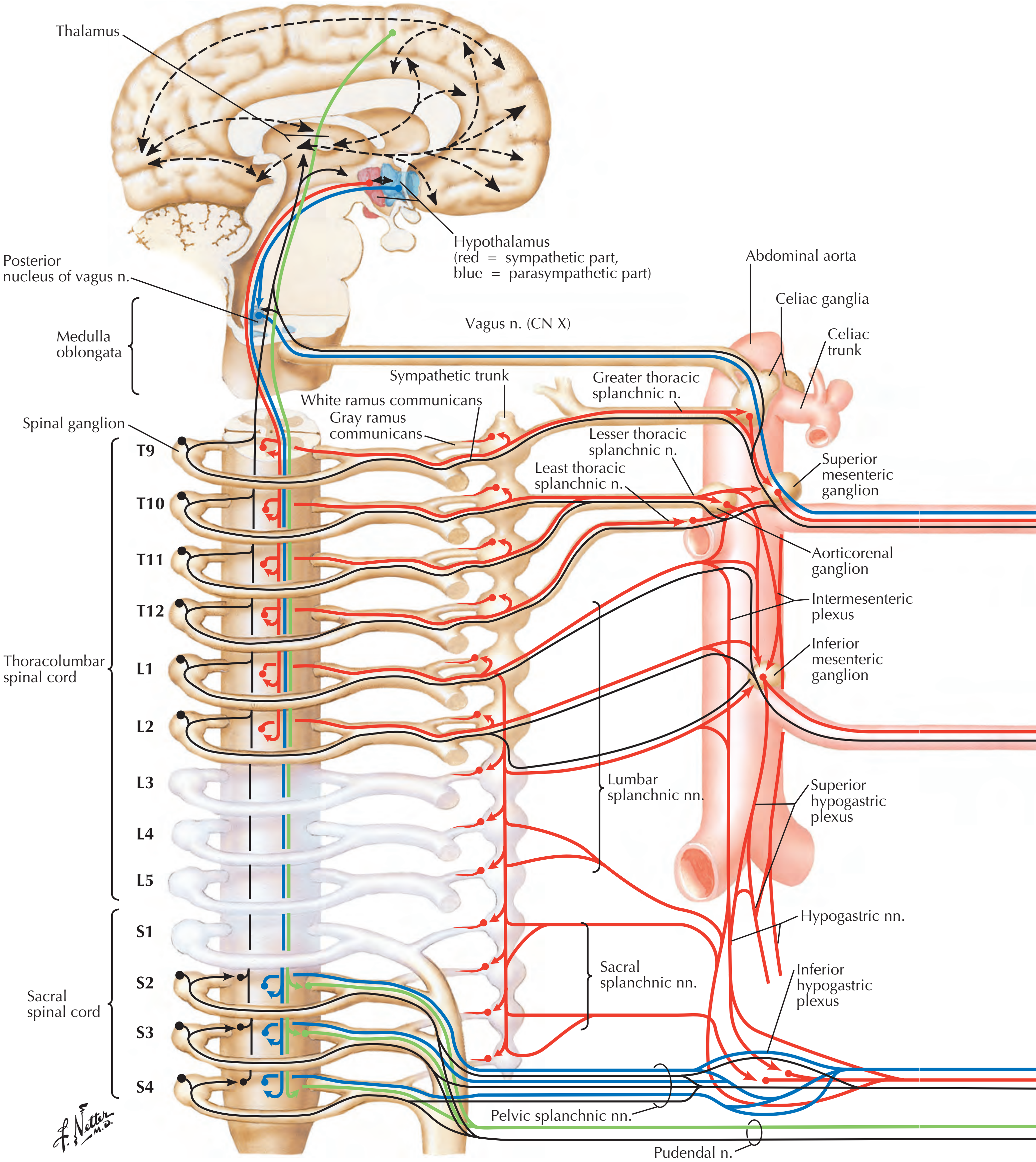
Autonomic Innervation of Large Intestine

See also **Plates 412, 413, 414**

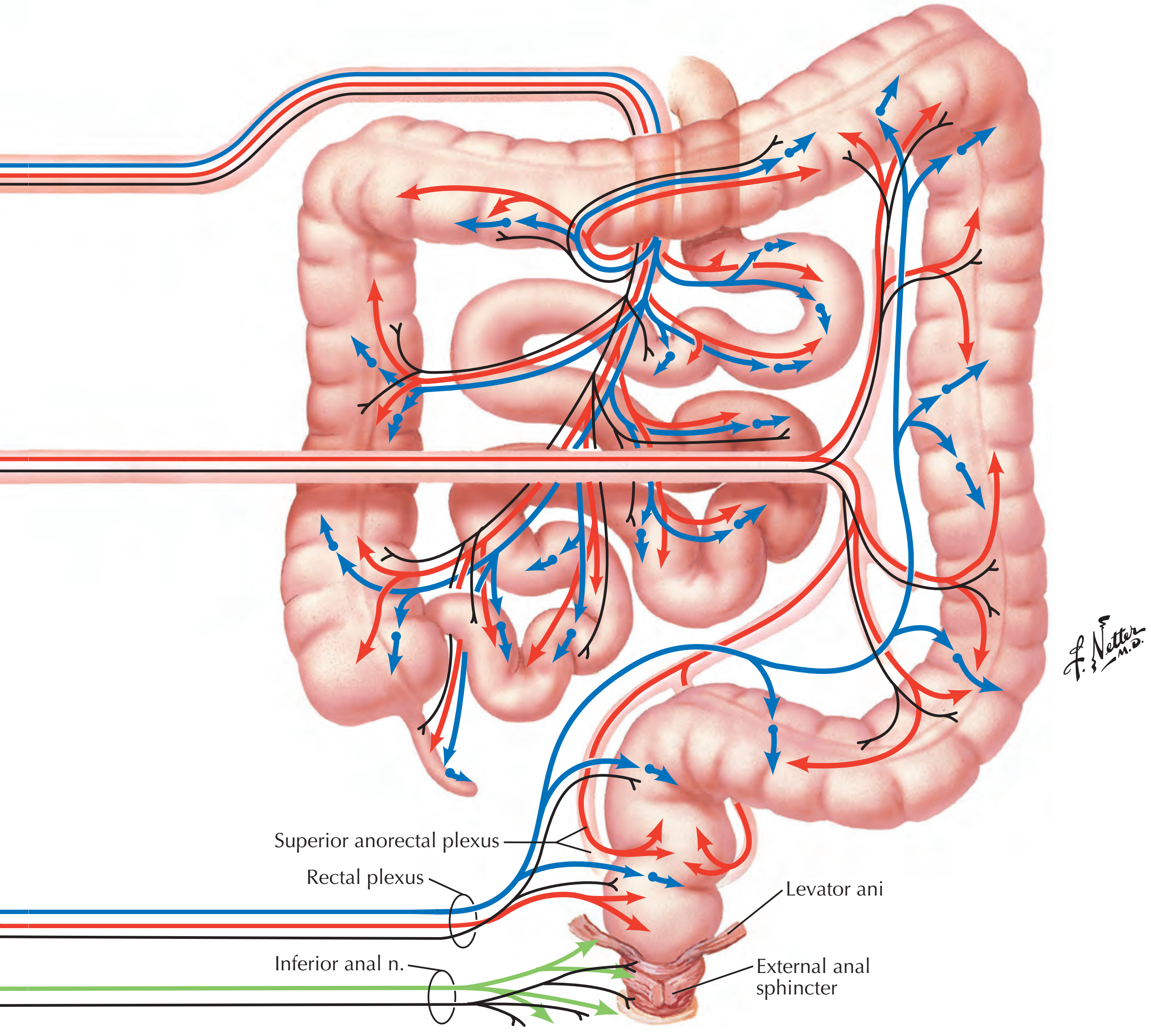

Anterior vagal trunk
Hepatic branch of anterior vagal trunk
Posterior vagal trunk
Greater thoracic splanchnic n.
Celiac ganglia
Celiac plexus
Right lesser thoracic splanchnic n.
Right least thoracic splanchnic n.
Right aortico-renal ganglion
Superior mesenteric ganglion
Middle colic plexus
Intermesenteric plexus
Right colic plexus
Ileocolic plexus
Cecal plexuses
Sympathetic trunk
Sacral plexus
Pelvic splanchnic nn.
Middle anorectal plexus
Right inferior hypogastric plexus
Vesical plexus
Rectal plexus
Urinary bladder
Marginal colic plexus
Esophagus
Greater thoracic splanchnic n.
Left suprarenal plexus
Left lesser thoracic splanchnic n.
Left least thoracic splanchnic n.
Left aorticorenal ganglion
Left renal plexus
Lumbar splanchnic n.
Sympathetic trunk
Left colic plexus
Inferior mesenteric ganglion
Inferior mesenteric plexus
Sigmoid plexuses
Superior hypogastric plexus
Superior anorectal plexus
Right and left hypogastric nn.
Nerves from inferior hypogastric plexuses to sigmoid colon, descending colon, and left colic flexure
F. Netter M.D.

Autonomic Innervation of Intestine: Schema

See also **Plates 6, 7**

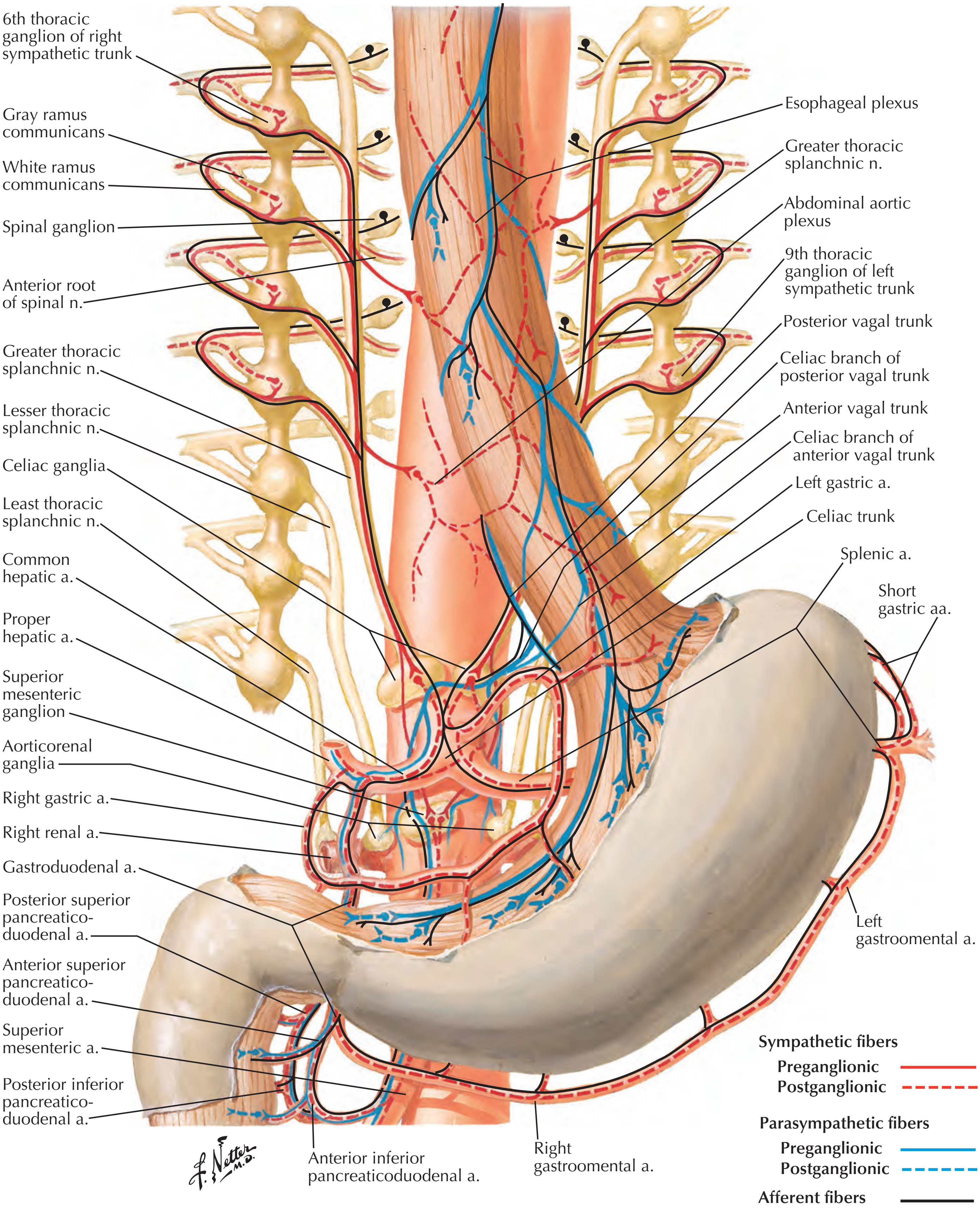

Thalamus
Posterior nucleus of vagus n.
Medulla oblongata
Hypothalamus (red = sympathetic part, blue = parasympathetic part)
Vagus n. (CN X)
Abdominal aorta
Celiac ganglia
Celiac trunk
Sympathetic trunk
Greater thoracic splanchnic n.
White ramus communicans
Gray ramus communicans
Spinal ganglion
Lesser thoracic splanchnic n.
Least thoracic splanchnic n.
Superior mesenteric ganglion
T9
T10
T11
T12
L1
L2
L3
L4
L5
S1
S2
S3
S4
Aorticorenal ganglion
Intermesenteric plexus
Thoracolumbar spinal cord
Inferior mesenteric ganglion
Lumbar splanchnic nn.
Superior hypogastric plexus
Hypogastric nn.
Sacral splanchnic nn.
Inferior hypogastric plexus
Sacral spinal cord
Pelvic splanchnic nn.
Pudendal n.
F. Netter M.D.

Sympathetic fibers ——
Parasympathetic fibers ——
Somatic efferent fibers ——
Afferents and CNS connections ——
Indefinite paths - - - -

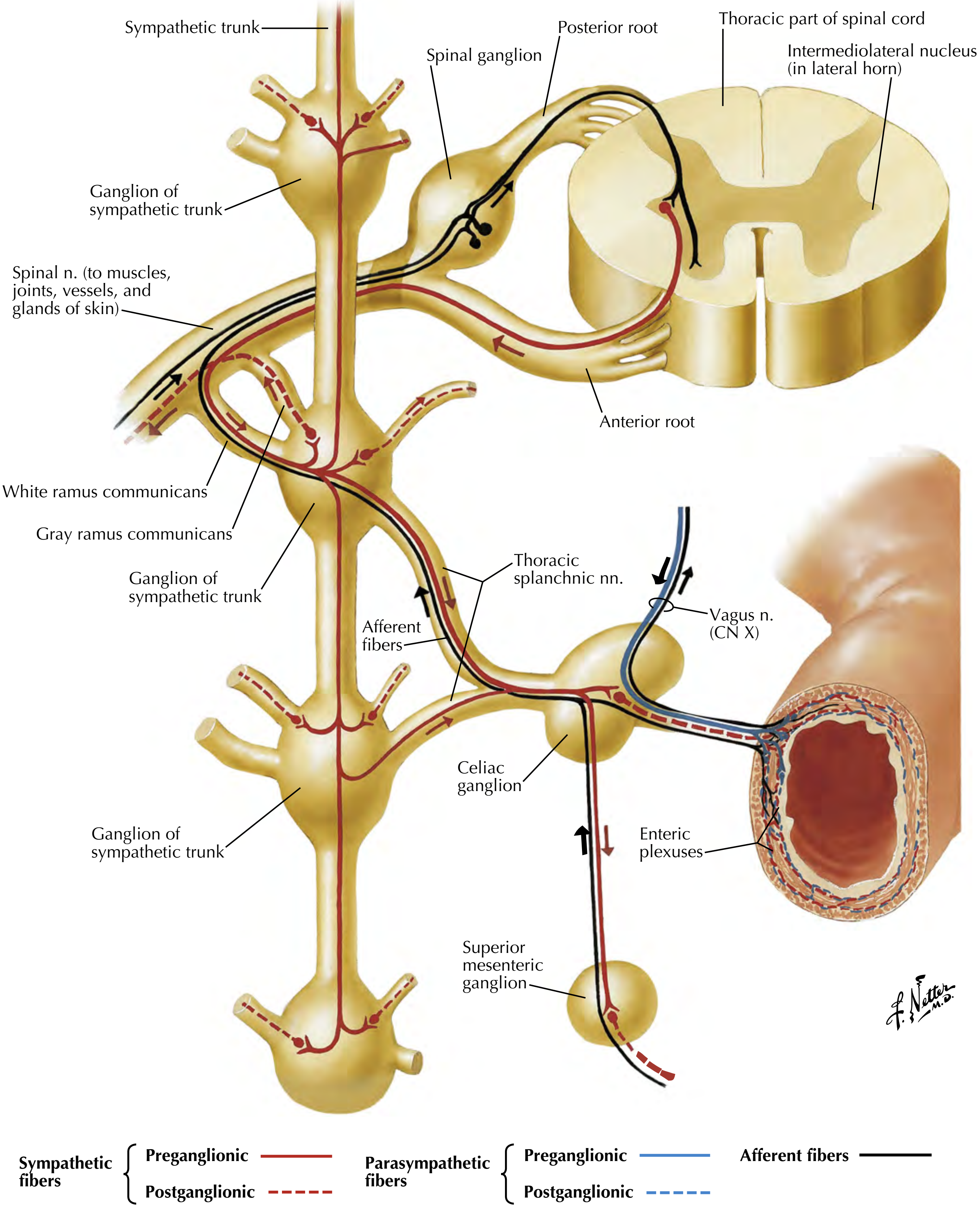

Superior anorectal plexus
Rectal plexus
Levator ani
Inferior anal n.
External anal sphincter
F. Netter M.D.

Autonomic Innervation of Esophagus, Stomach, and Duodenum: Schema

See also **Plates 6, 7**

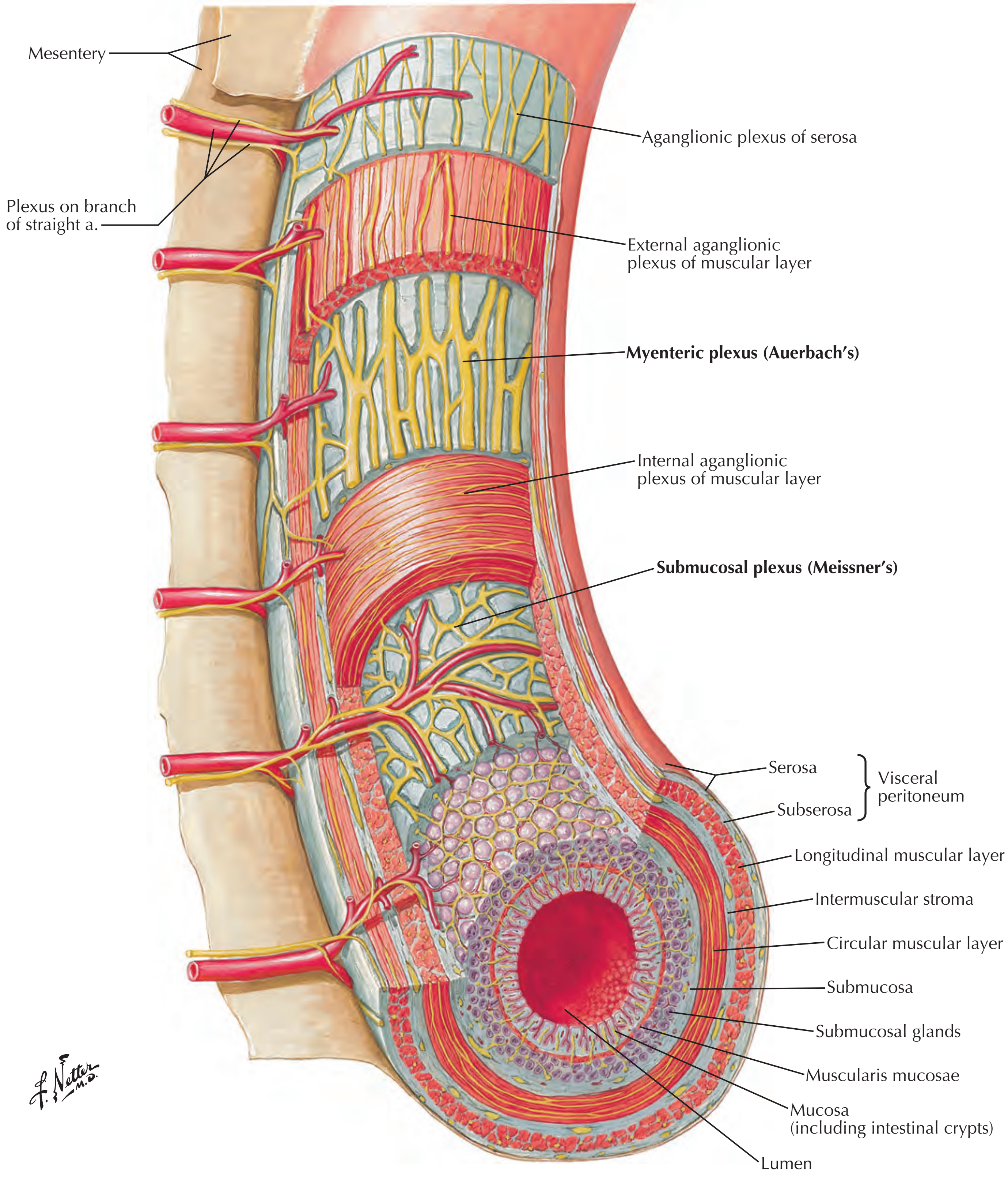


6th thoracic ganglion of right sympathetic trunk
Gray ramus communicans
White ramus communicans
Spinal ganglion
Anterior root of spinal n.
Greater thoracic splanchnic n.
Lesser thoracic splanchnic n.
Celiac ganglia
Least thoracic splanchnic n.
Common hepatic a.
Proper hepatic a.
Superior mesenteric ganglion
Aorticorenal ganglia
Right gastric a.
Right renal a.
Gastroduodenal a.
Posterior superior pancreatico-duodenal a.
Anterior superior pancreatico-duodenal a.
Superior mesenteric a.
Posterior inferior pancreatico-duodenal a.
Anterior inferior pancreaticoduodenal a.
Right gastroomental a.
Esophageal plexus
Greater thoracic splanchnic n.
Abdominal aortic plexus
9th thoracic ganglion of left sympathetic trunk
Posterior vagal trunk
Celiac branch of posterior vagal trunk
Anterior vagal trunk
Celiac branch of anterior vagal trunk
Left gastric a.
Celiac trunk
Splenic a.
Short gastric aa.
Left gastroomental a.
Sympathetic fibers
Preganglionic
Postganglionic
Parasympathetic fibers
Preganglionic
Postganglionic
Afferent fibers
F. Netter M.D.


Sympathetic trunk
Spinal ganglion
Posterior root
Thoracic part of spinal cord
Intermediolateral nucleus (in lateral horn)
Ganglion of sympathetic trunk
Spinal n. (to muscles, joints, vessels, and glands of skin)
White ramus communicans
Gray ramus communicans
Ganglion of sympathetic trunk
Anterior root
Thoracic splanchnic nn.
Afferent fibers
Vagus n. (CN X)
Celiac ganglion
Enteric plexuses
Ganglion of sympathetic trunk
Superior mesenteric ganglion
Sympathetic fibers
Preganglionic
Postganglionic
Parasympathetic fibers
Preganglionic
Postganglionic
Afferent fibers

Enteric Plexuses of Intestine

See also **Plate BP 48**

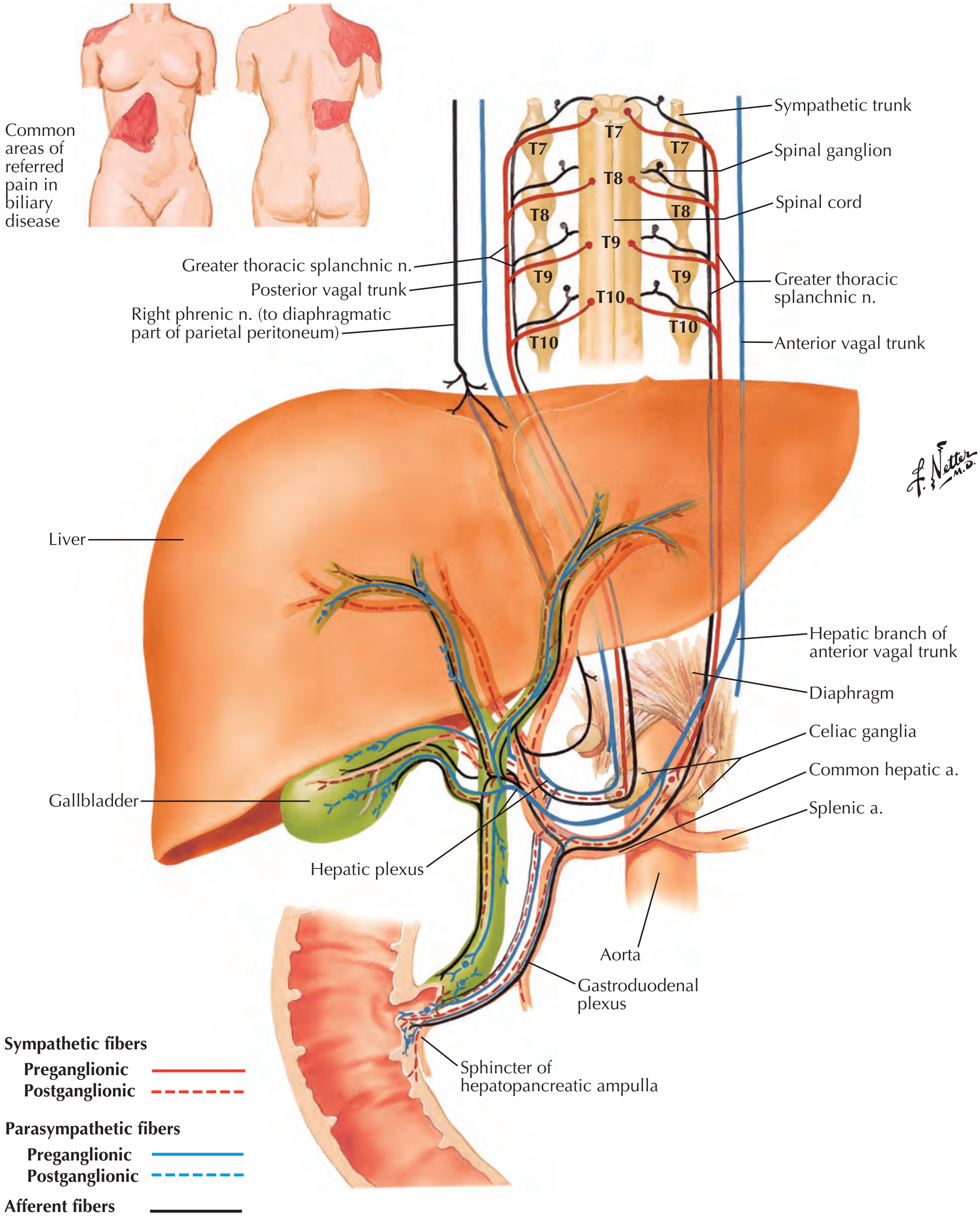


Mesentery
Aganglionic plexus of serosa
Plexus on branch of straight a.
External aganglionic plexus of muscular layer
Myenteric plexus (Auerbach's)
Internal aganglionic plexus of muscular layer
Submucosal plexus (Meissner's)
Serosa
Subserosa
Visceral peritoneum
Longitudinal muscular layer
Intermuscular stroma
Circular muscular layer
Submucosa
Submucosal glands
Muscularis mucosae
Mucosa (including intestinal crypts)
Lumen

Note: Intestinal wall is shown much thicker than in actuality.

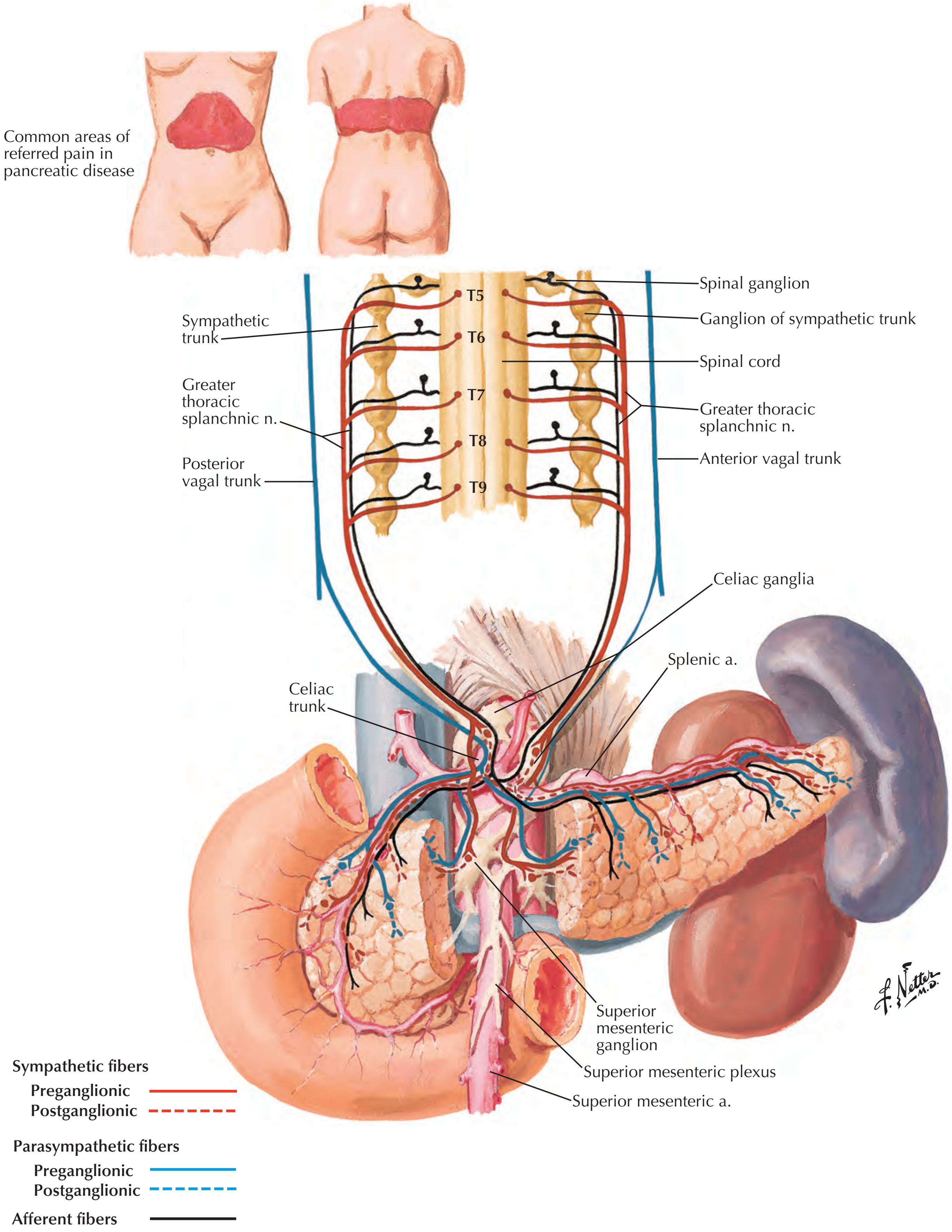
Autonomic Innervation of Liver: Schema

See also **Plates 6, 7**

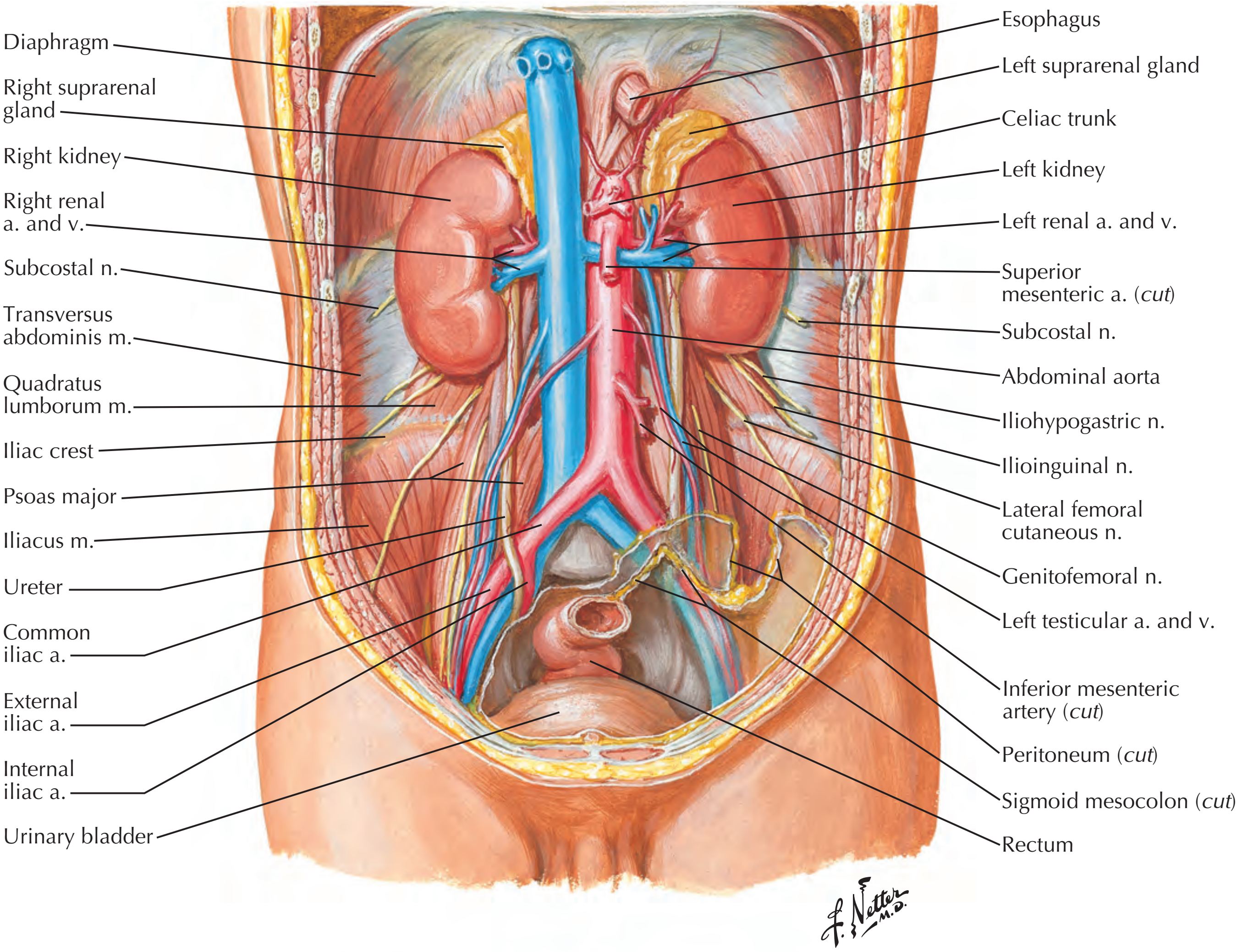

Common areas of referred pain in biliary disease
Sympathetic trunk
Spinal ganglion
Spinal cord
T7
T7
T7
T8
T8
T8
T9
T9
T9
T10
T10
T10
Greater thoracic splanchnic n.
Posterior vagal trunk
Right phrenic n. (to diaphragmatic part of parietal peritoneum)
Greater thoracic splanchnic n.
Anterior vagal trunk
Liver
Hepatic branch of anterior vagal trunk
Diaphragm
Celiac ganglia
Common hepatic a.
Splenic a.
Gallbladder
Hepatic plexus
Aorta
Gastroduodenal plexus
Sphincter of hepatopancreatic ampulla
Sympathetic fibers
Preganglionic
Postganglionic
Parasympathetic fibers
Preganglionic
Postganglionic
Afferent fibers

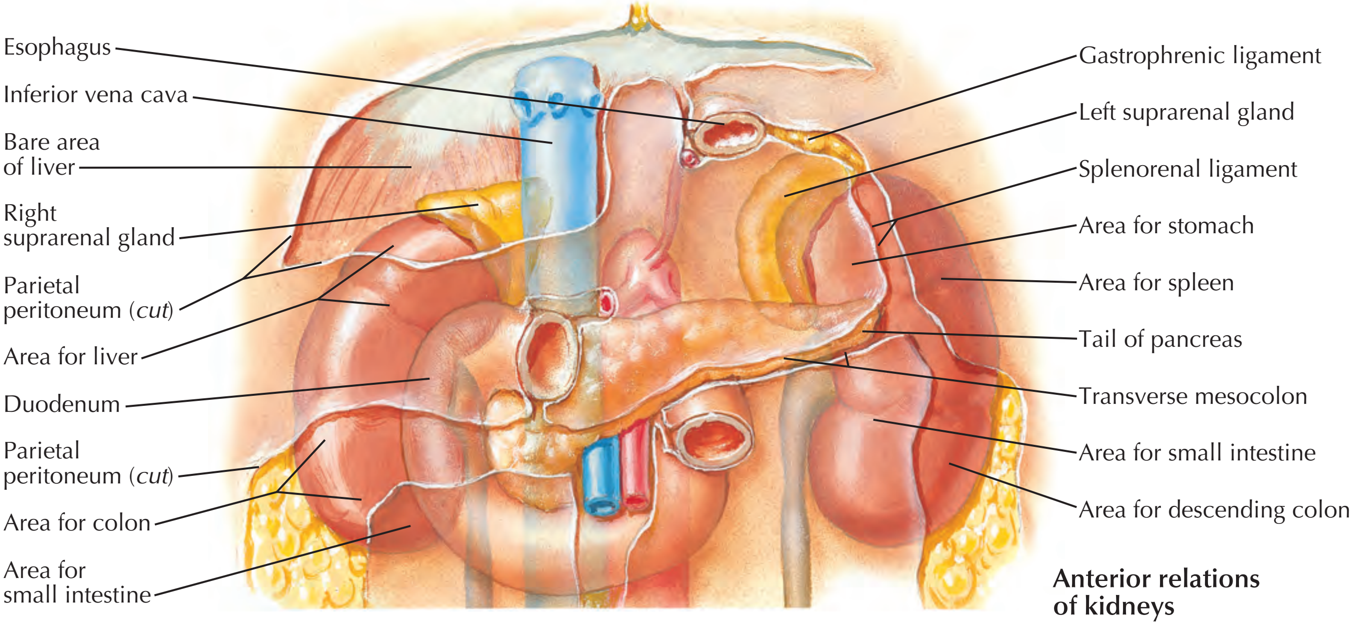
Autonomic Innervation of Pancreas: Schema

See also **Plates 6, 7**

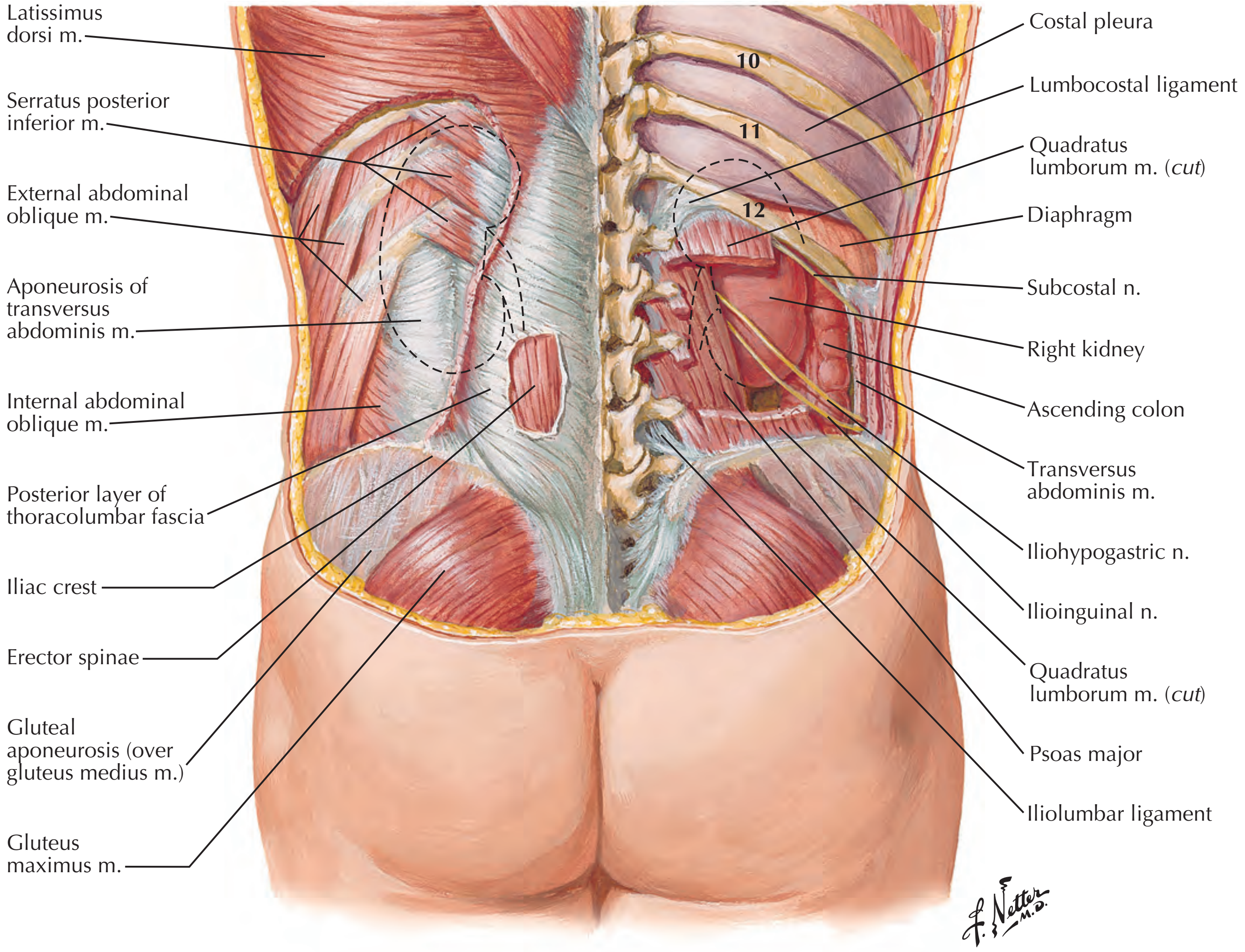


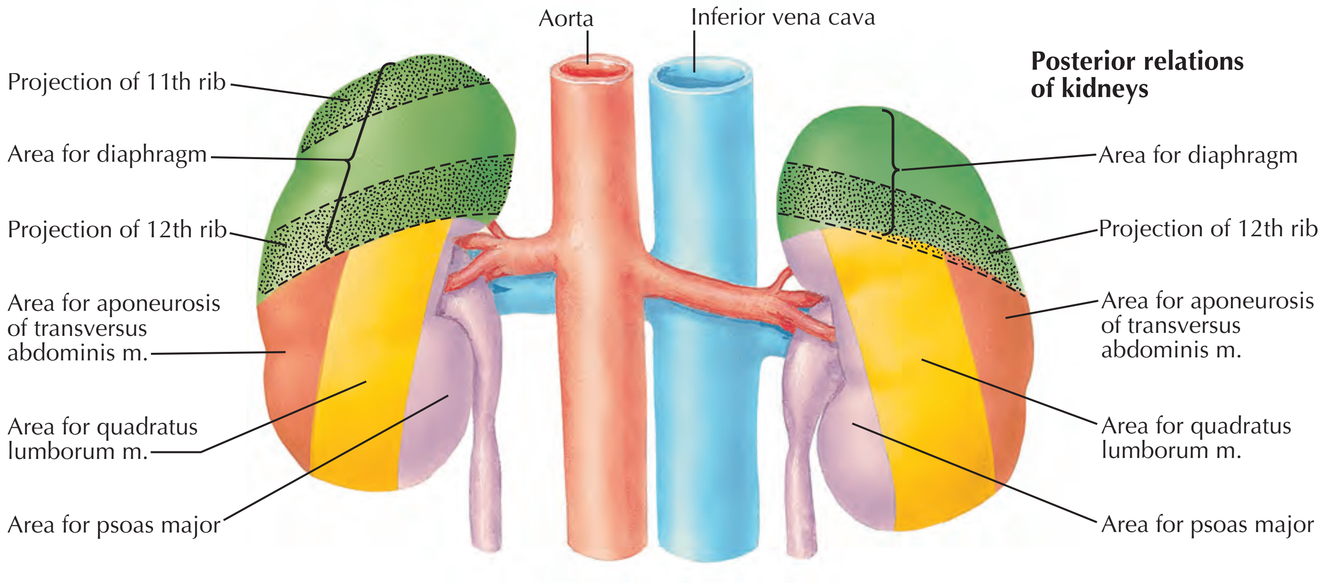
Common areas of referred pain in pancreatic disease
Sympathetic trunk
Greater thoracic splanchnic n.
Posterior vagal trunk
T5
T6
T7
T8
T9
Spinal ganglion
Ganglion of sympathetic trunk
Spinal cord
Greater thoracic splanchnic n.
Anterior vagal trunk
Celiac ganglia
Splenic a.
Celiac trunk
Superior mesenteric ganglion
Superior mesenteric plexus
Superior mesenteric a.
Sympathetic fibers
Preganglionic
Postganglionic
Parasympathetic fibers
Preganglionic
Postganglionic
Afferent fibers


Diaphragm
Right suprarenal gland
Right kidney
Right renal a. and v.
Subcostal n.
Transversus abdominis m.
Quadratus lumborum m.
Iliac crest
Psoas major
Iliacus m.
Ureter
Common iliac a.
External iliac a.
Internal iliac a.
Urinary bladder
Esophagus
Left suprarenal gland
Celiac trunk
Left kidney
Left renal a. and v.
Superior mesenteric a. (*cut*)
Subcostal n.
Abdominal aorta
Iliohypogastric n.
Ilioinguinal n.
Lateral femoral cutaneous n.
Genitofemoral n.
Left testicular a. and v.
Inferior mesenteric artery (*cut*)
Peritoneum (*cut*)
Sigmoid mesocolon (*cut*)
Rectum
F. Netter M.D.


Esophagus
Inferior vena cava
Bare area of liver
Right suprarenal gland
Parietal peritoneum (*cut*)
Area for liver
Duodenum
Parietal peritoneum (*cut*)
Area for colon
Area for small intestine
Gastrophrenic ligament
Left suprarenal gland
Splenorenal ligament
Area for stomach
Area for spleen
Tail of pancreas
Transverse mesocolon
Area for small intestine
Area for descending colon

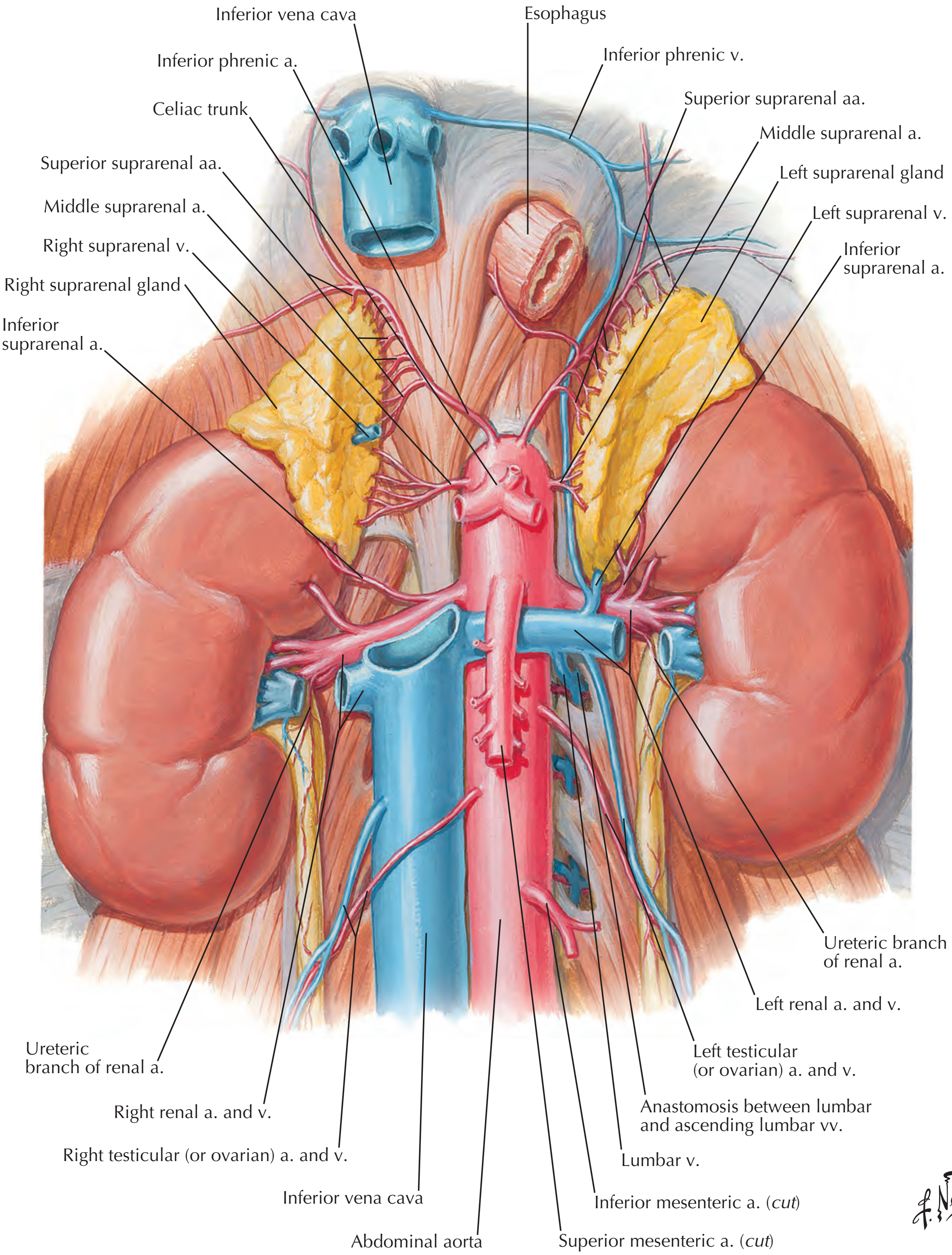
Anterior relations of kidneys


Latissimus dorsi m.
Serratus posterior inferior m.
External abdominal oblique m.
Aponeurosis of transversus abdominis m.
Internal abdominal oblique m.
Posterior layer of thoracolumbar fascia
Iliac crest
Erector spinae
Gluteal aponeurosis (over gluteus medius m.)
Gluteus maximus m.
10
11
12
Costal pleura
Lumbocostal ligament
Quadratus lumborum m. (*cut*)
Diaphragm
Subcostal n.
Right kidney
Ascending colon
Transversus abdominis m.
Iliohypogastric n.
Ilioinguinal n.
Quadratus lumborum m. (*cut*)
Psoas major
Iliolumbar ligament
F. Netter M.D.


Aorta
Inferior vena cava
Projection of 11th rib
Area for diaphragm
Projection of 12th rib
Area for aponeurosis of transversus abdominis m.
Area for quadratus lumborum m.
Area for psoas major
Area for diaphragm
Projection of 12th rib
Area for aponeurosis of transversus abdominis m.
Area for quadratus lumborum m.
Area for psoas major

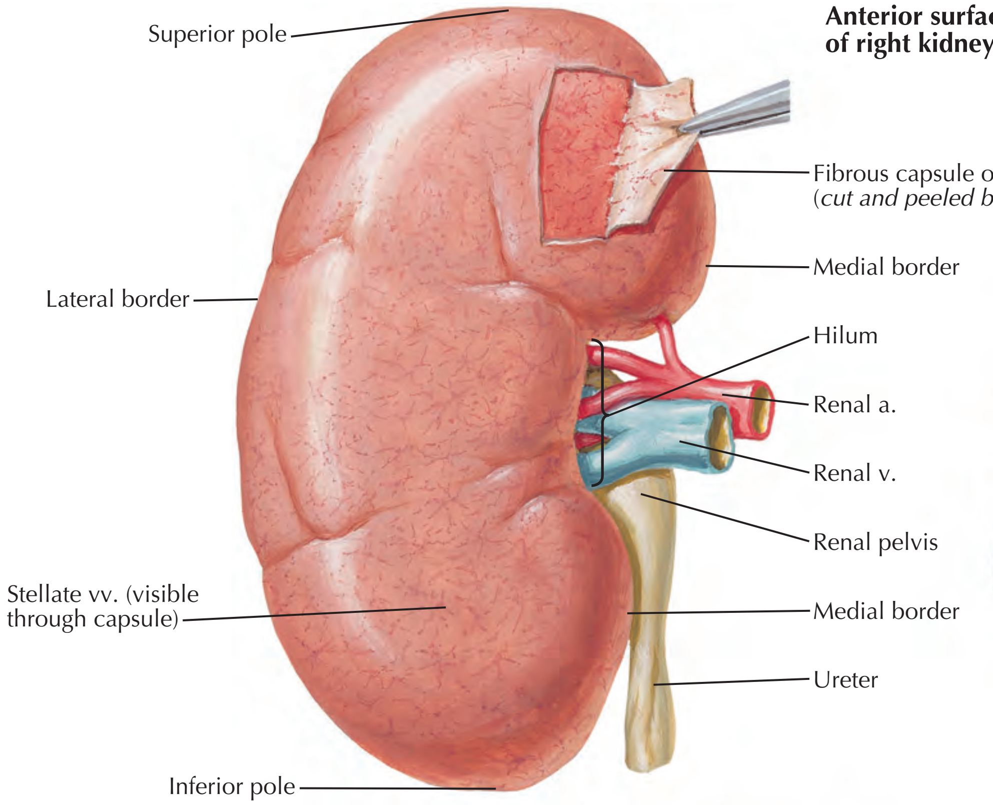
Posterior relations of kidneys

See also **Plates 342, BP 70**

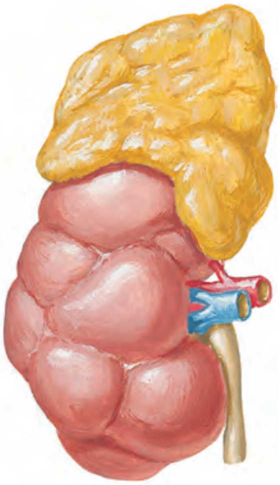

Inferior vena cava
Inferior phrenic a.
Celiac trunk
Superior suprarenal aa.
Middle suprarenal a.
Right suprarenal v.
Right suprarenal gland
Inferior suprarenal a.
Esophagus
Inferior phrenic v.
Superior suprarenal aa.
Middle suprarenal a.
Left suprarenal gland
Left suprarenal v.
Inferior suprarenal a.
Ureteric branch of renal a.
Left renal a. and v.
Left testicular (or ovarian) a. and v.
Anastomosis between lumbar and ascending lumbar vv.
Lumbar v.
Inferior mesenteric a. (*cut*)
Superior mesenteric a. (*cut*)
Abdominal aorta
Inferior vena cava
Right testicular (or ovarian) a. and v.
Right renal a. and v.
Ureteric branch of renal a.
F. Netter M.D.

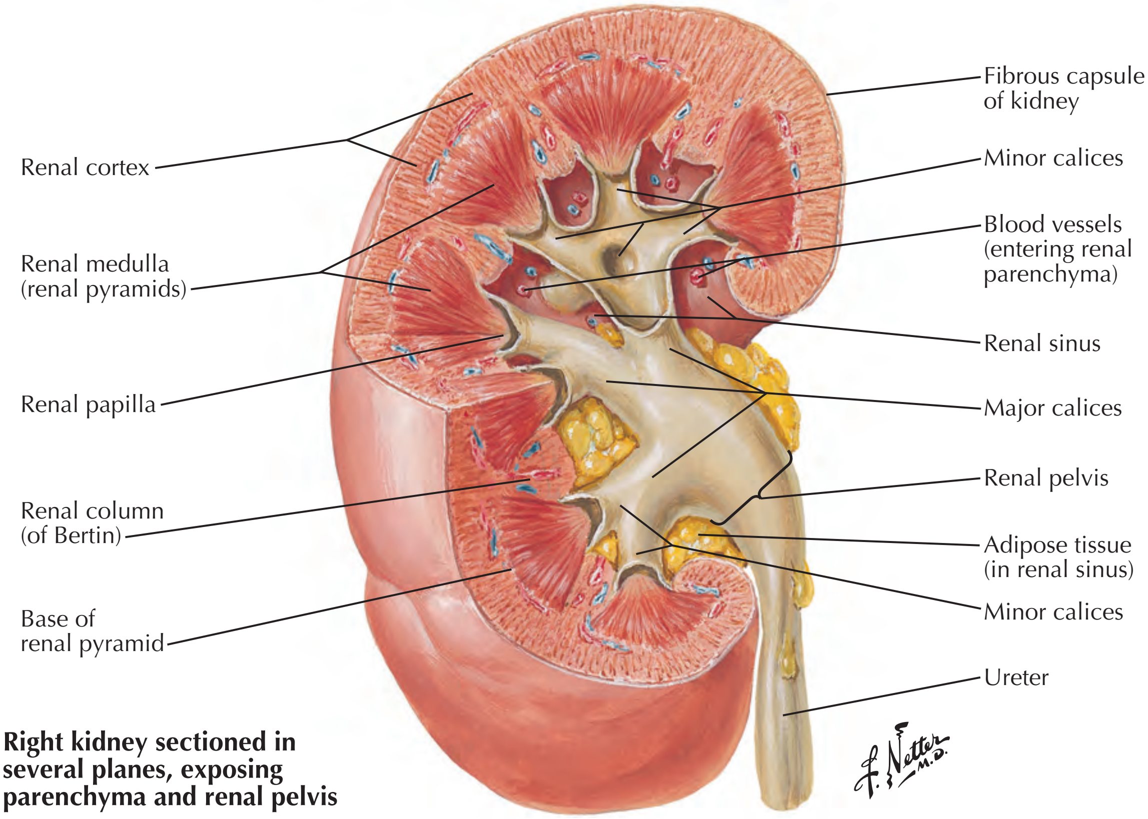
Gross Structure of Kidney

See also **Plates 71, 72**

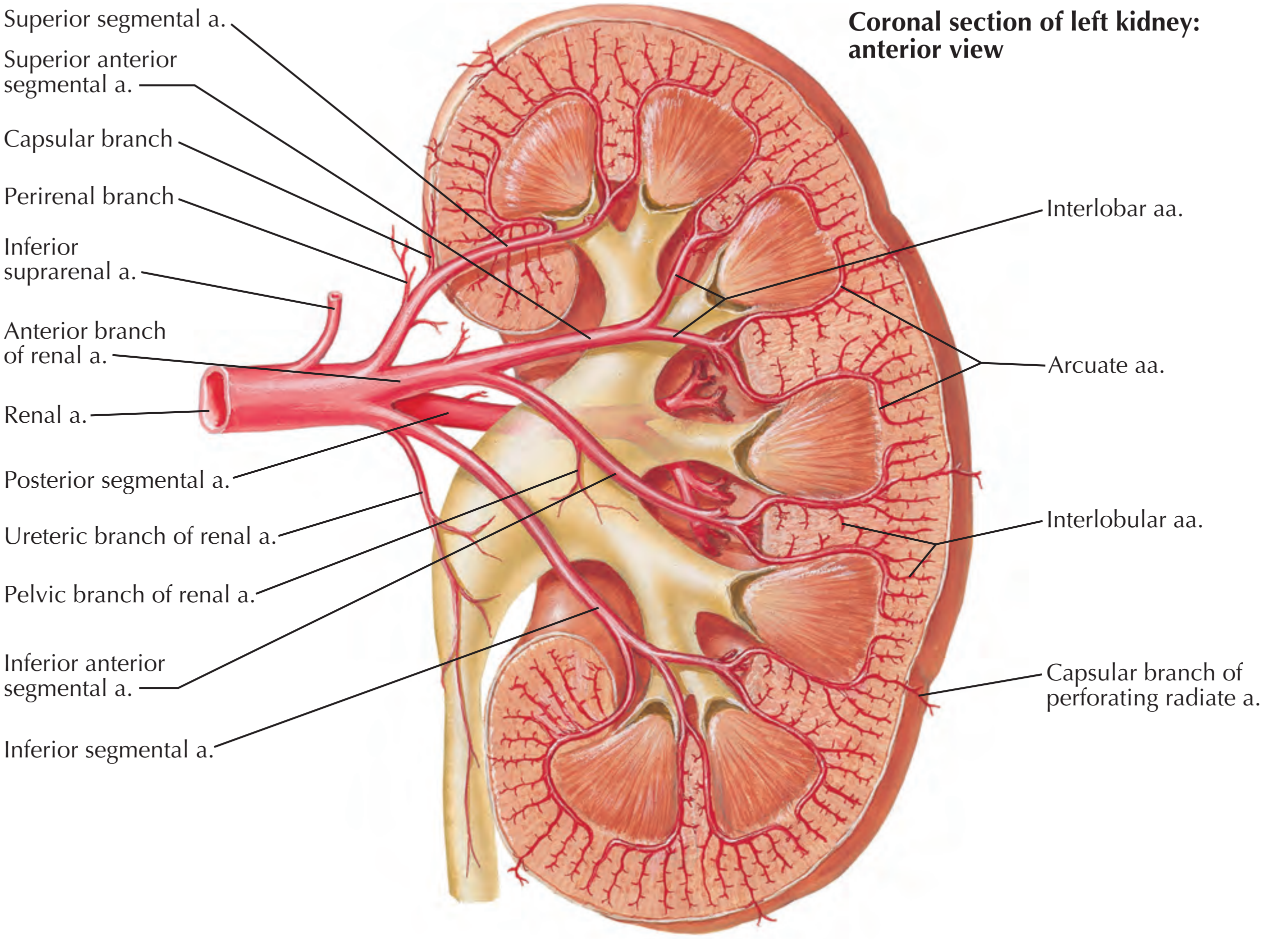

Anterior surface of right kidney

Superior pole
Fibrous capsule of kidney (*cut and peeled back*)
Medial border
Lateral border
Hilum
Renal a.
Renal v.
Renal pelvis
Stellate vv. (visible through capsule)
Medial border
Ureter
Inferior pole

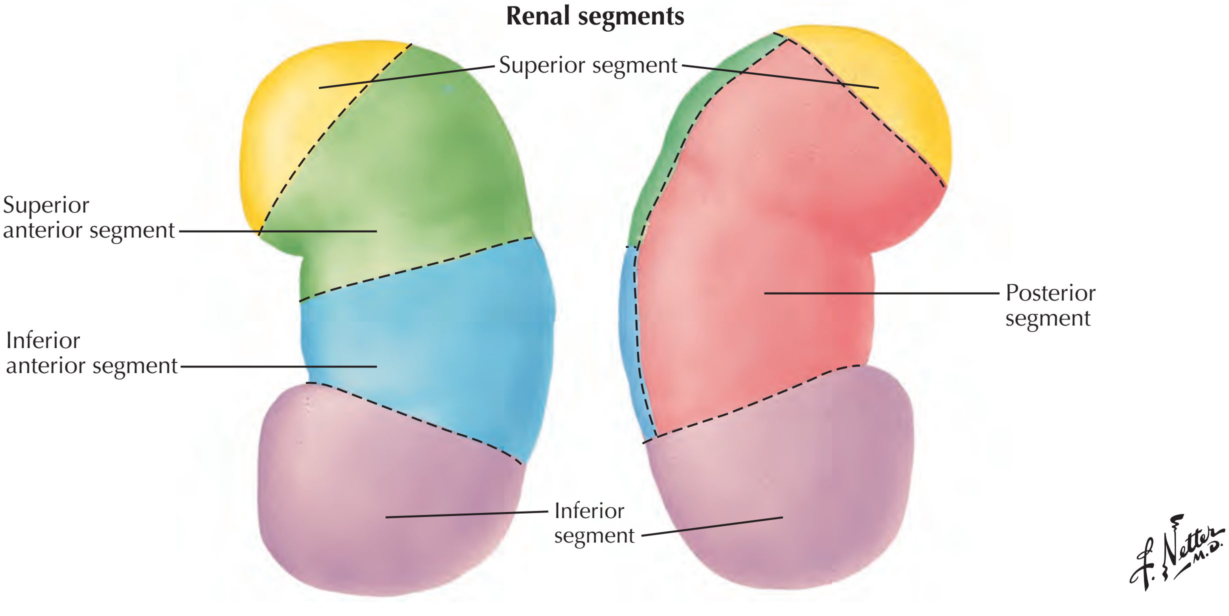

Suprarenal gland and lobulated kidney of infant


Fibrous capsule of kidney
Renal cortex
Minor calices
Blood vessels (entering renal parenchyma)
Renal medulla (renal pyramids)
Renal sinus
Renal papilla
Major calices
Renal pelvis
Renal column (of Bertin)
Adipose tissue (in renal sinus)
Minor calices
Base of renal pyramid
Ureter

Right kidney sectioned in several planes, exposing parenchyma and renal pelvis


Coronal section of left kidney: anterior view
Superior segmental a.
Superior anterior segmental a.
Capsular branch
Perirenal branch
Inferior suprarenal a.
Anterior branch of renal a.
Renal a.
Posterior segmental a.
Ureteric branch of renal a.
Pelvic branch of renal a.
Inferior anterior segmental a.
Inferior segmental a.
Interlobar aa.
Arcuate aa.
Interlobular aa.
Capsular branch of perforating radiate a.

Renal segments

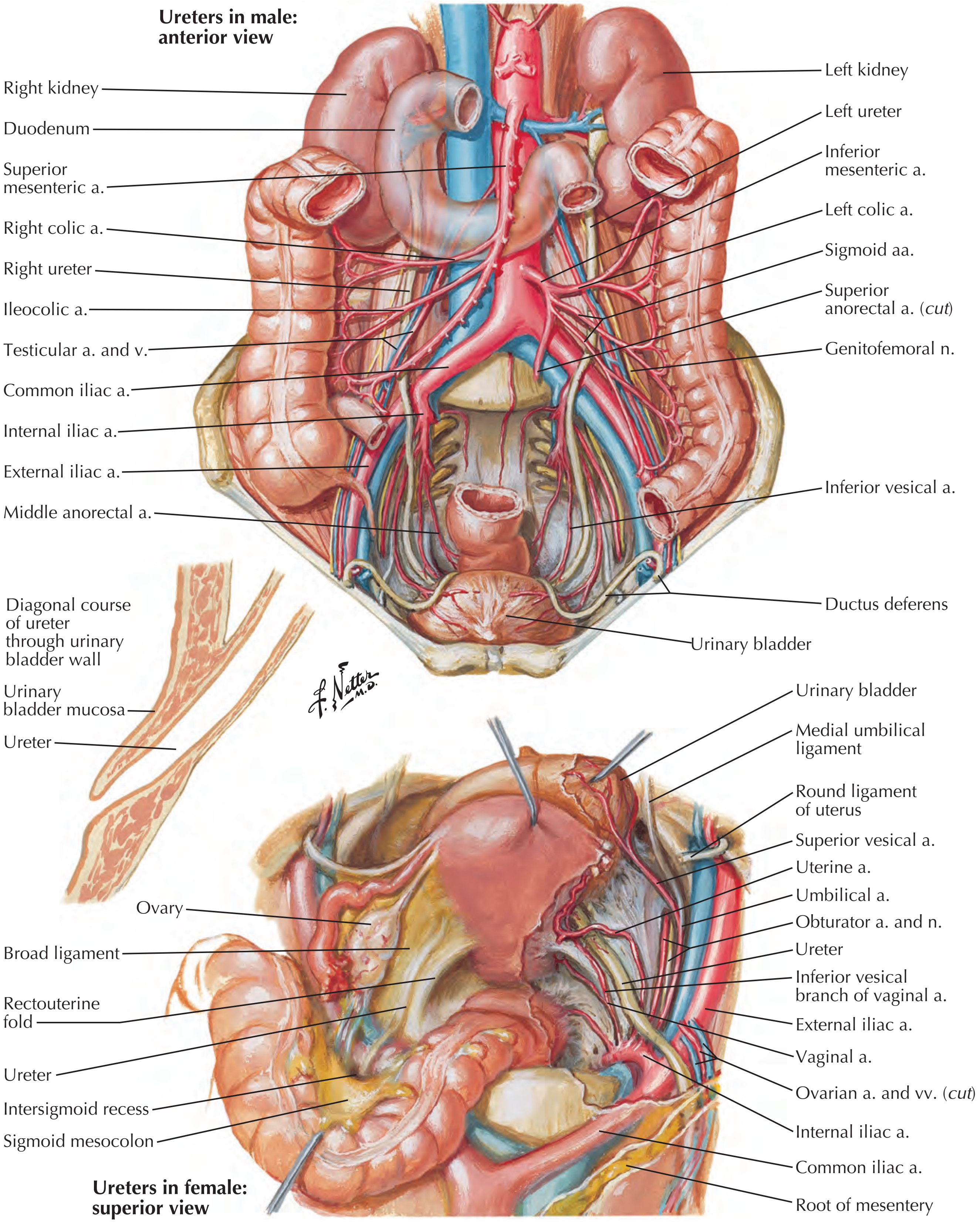

Superior segment
Superior anterior segment
Inferior anterior segment
Posterior segment
Inferior segment

Anterior surface of left kidney

Posterior surface of left kidney

Ureters in Abdomen and Pelvis

See also **Plates 363, 365, 367**



Ureters in male: anterior view

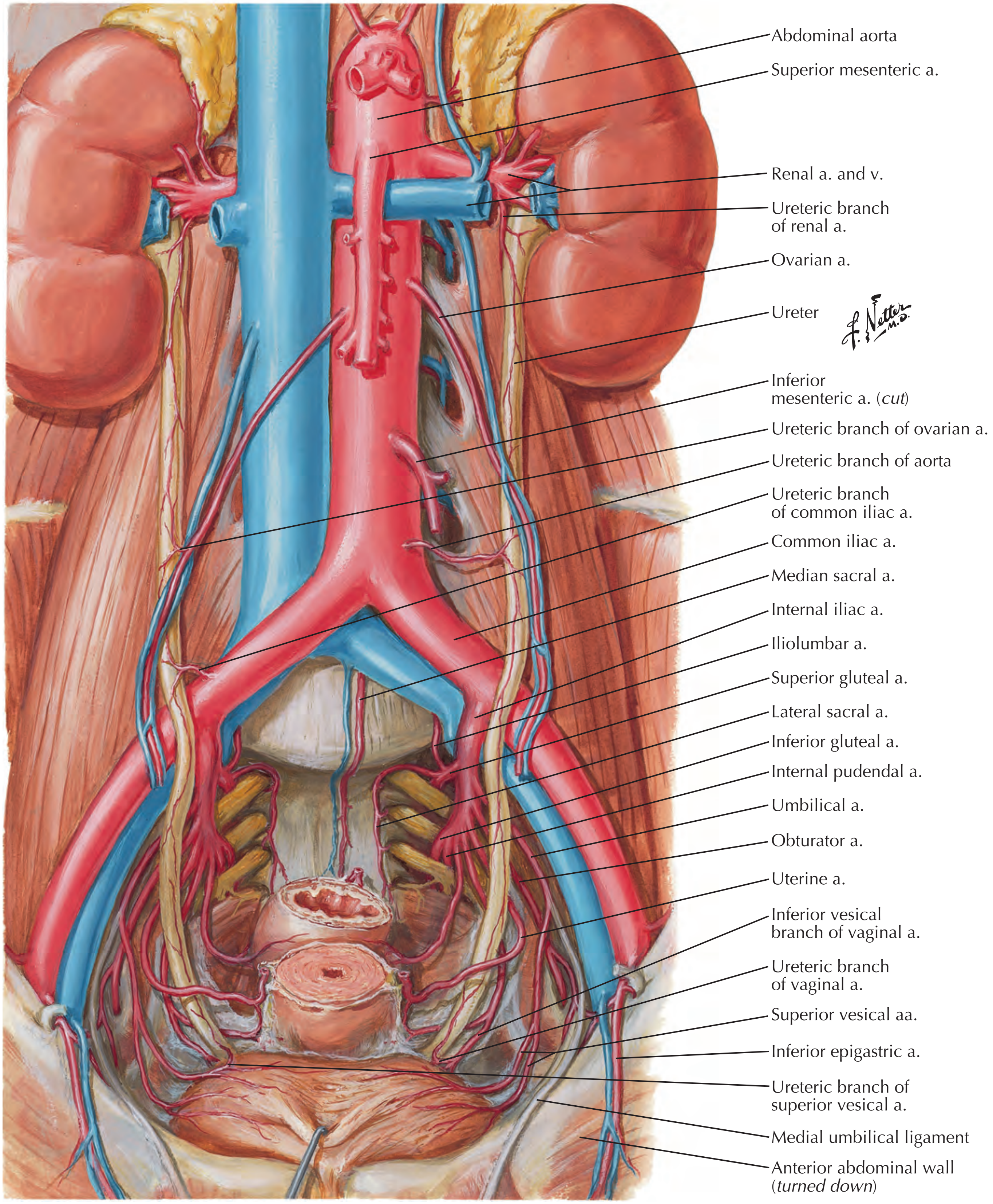
Right kidney
Duodenum
Superior mesenteric a.
Right colic a.
Right ureter
Ileocolic a.
Testicular a. and v.
Common iliac a.
Internal iliac a.
External iliac a.
Middle anorectal a.
Left kidney
Left ureter
Inferior mesenteric a.
Left colic a.
Sigmoid aa.
Superior anorectal a. (cut)
Genitofemoral n.
Inferior vesical a.
Ductus deferens
Urinary bladder

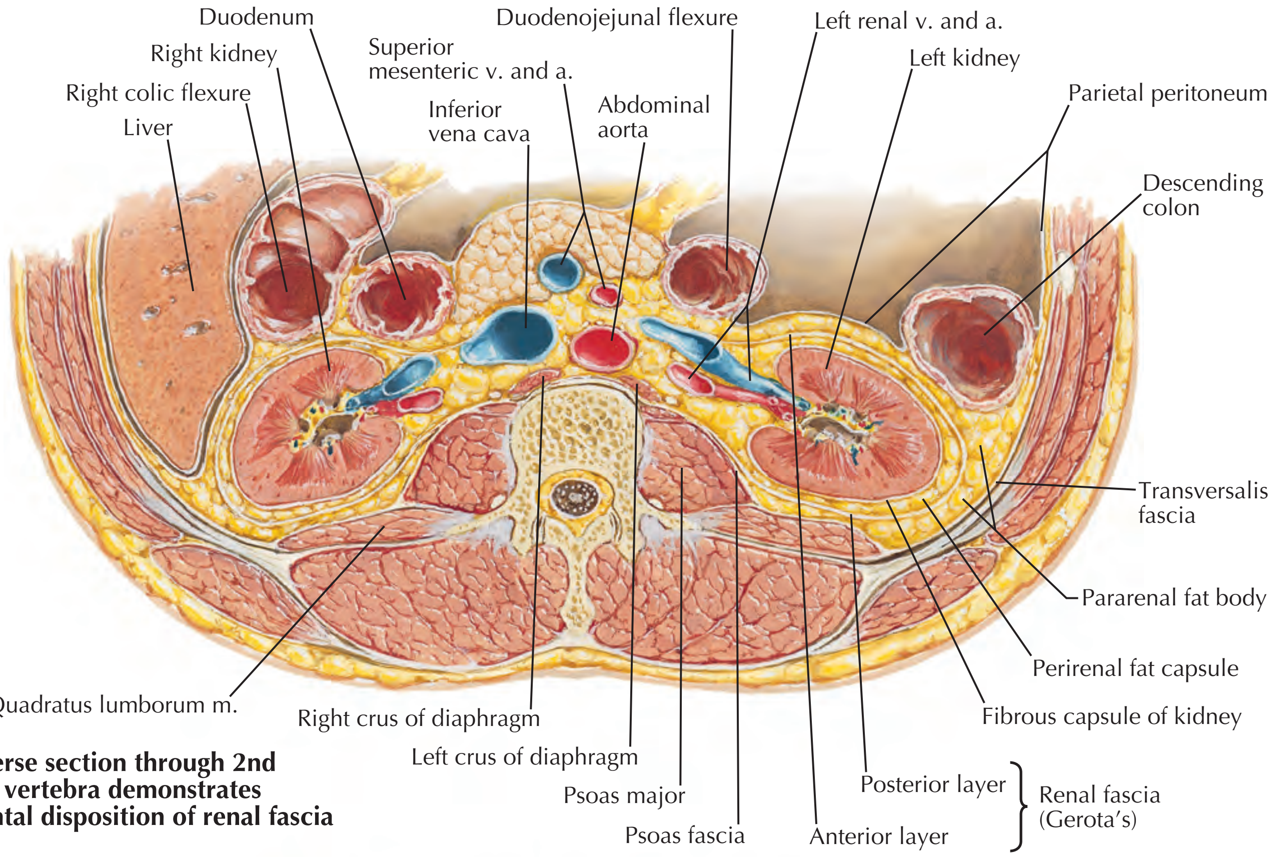
Diagonal course of ureter through urinary bladder wall

Urinary bladder mucosa
Ureter

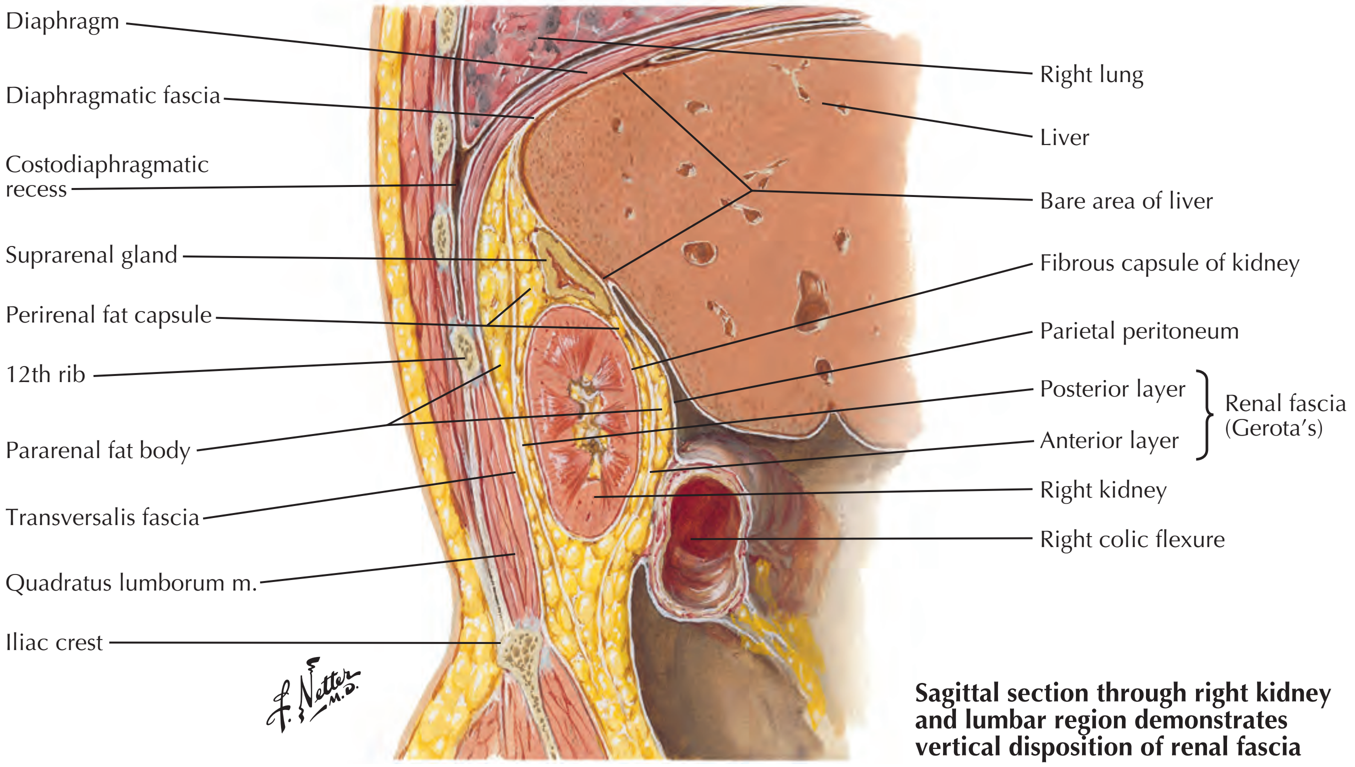
Ureters in female: superior view

Urinary bladder
Medial umbilical ligament
Round ligament of uterus
Superior vesical a.
Uterine a.
Umbilical a.
Obturator a. and n.
Ureter
Inferior vesical branch of vaginal a.
External iliac a.
Vaginal a.
Ovarian a. and vv. (cut)
Internal iliac a.
Common iliac a.
Root of mesentery
Ovary
Broad ligament
Rectouterine fold
Ureter
Intersigmoid recess
Sigmoid mesocolon


Abdominal aorta
Superior mesenteric a.
Renal a. and v.
Ureteric branch of renal a.
Ovarian a.
Ureter
F. Netter M.D.
Inferior mesenteric a. (*cut*)
Ureteric branch of ovarian a.
Ureteric branch of aorta
Ureteric branch of common iliac a.
Common iliac a.
Median sacral a.
Internal iliac a.
Iliolumbar a.
Superior gluteal a.
Lateral sacral a.
Inferior gluteal a.
Internal pudendal a.
Umbilical a.
Obturator a.
Uterine a.
Inferior vesical branch of vaginal a.
Ureteric branch of vaginal a.
Superior vesical aa.
Inferior epigastric a.
Ureteric branch of superior vesical a.
Medial umbilical ligament
Anterior abdominal wall (*turned down*)


Duodenum
Right kidney
Right colic flexure
Liver
Superior mesenteric v. and a.
Inferior vena cava
Duodenojejunal flexure
Abdominal aorta
Left renal v. and a.
Left kidney
Parietal peritoneum
Descending colon
Transversalis fascia
Pararenal fat body
Perirenal fat capsule
Fibrous capsule of kidney
Quadratus lumborum m.
Right crus of diaphragm
Left crus of diaphragm
Psoas major
Psoas fascia
Posterior layer
Anterior layer
Renal fascia (Gerota's)

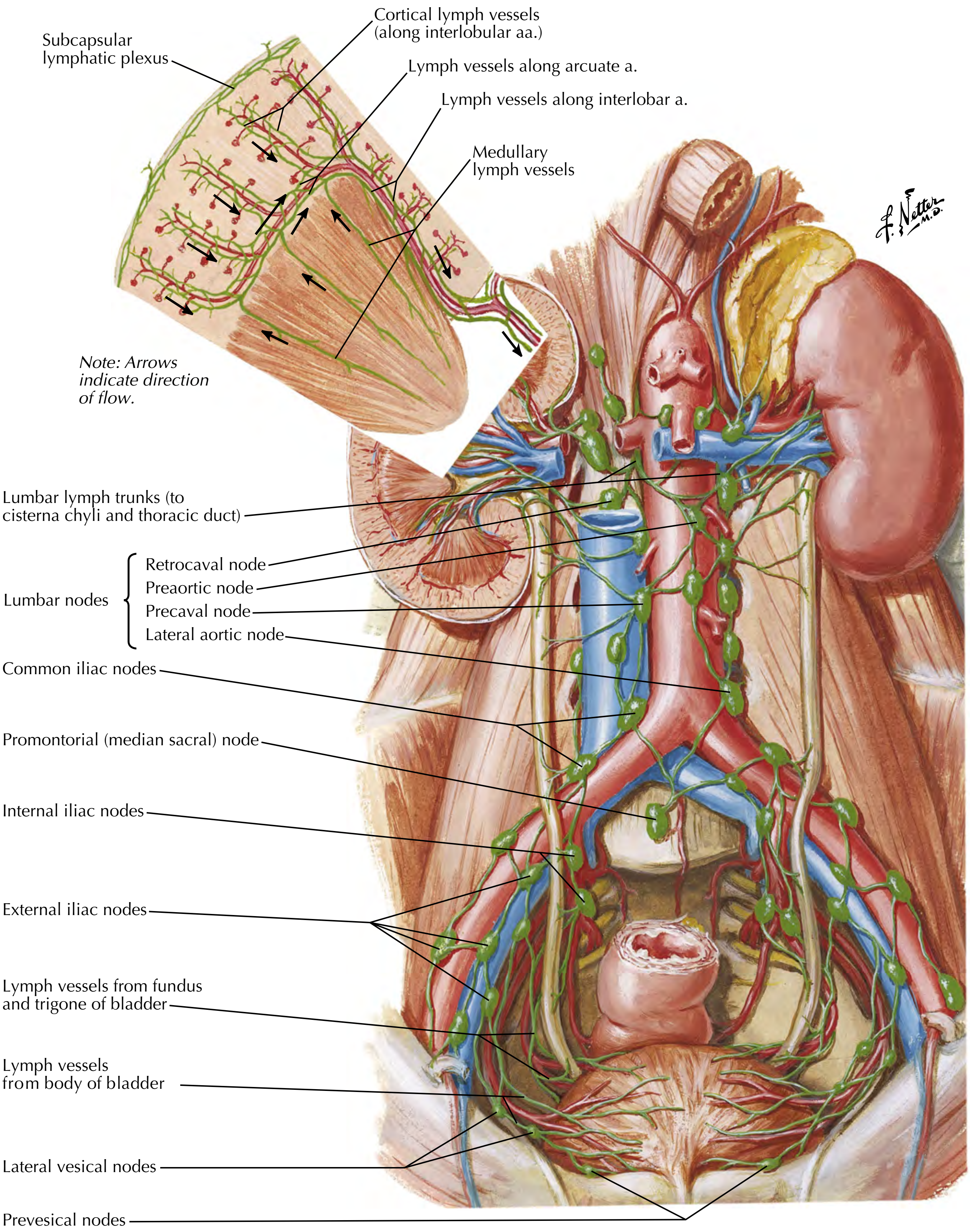
Transverse section through 2nd lumbar vertebra demonstrates horizontal disposition of renal fascia

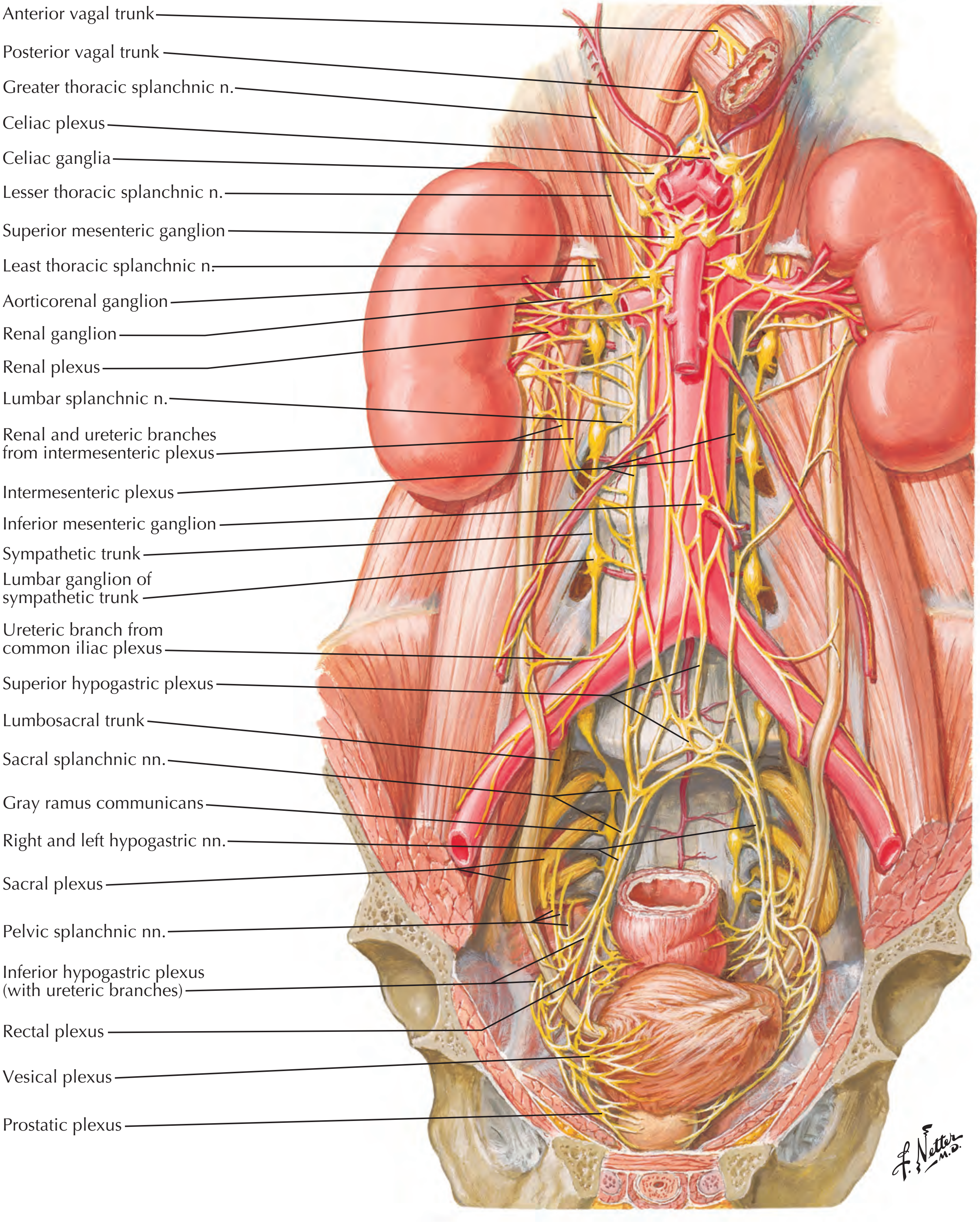

Diaphragm
Diaphragmatic fascia
Costodiaphragmatic recess
Suprarenal gland
Perirenal fat capsule
12th rib
Pararenal fat body
Transversalis fascia
Quadratus lumborum m.
Iliac crest
Right lung
Liver
Bare area of liver
Fibrous capsule of kidney
Parietal peritoneum
Posterior layer
Anterior layer
Renal fascia (Gerota's)
Right kidney
Right colic flexure

Sagittal section through right kidney and lumbar region demonstrates vertical disposition of renal fascia

Lymph Vessels and Lymph Nodes of Kidneys and Urinary Bladder

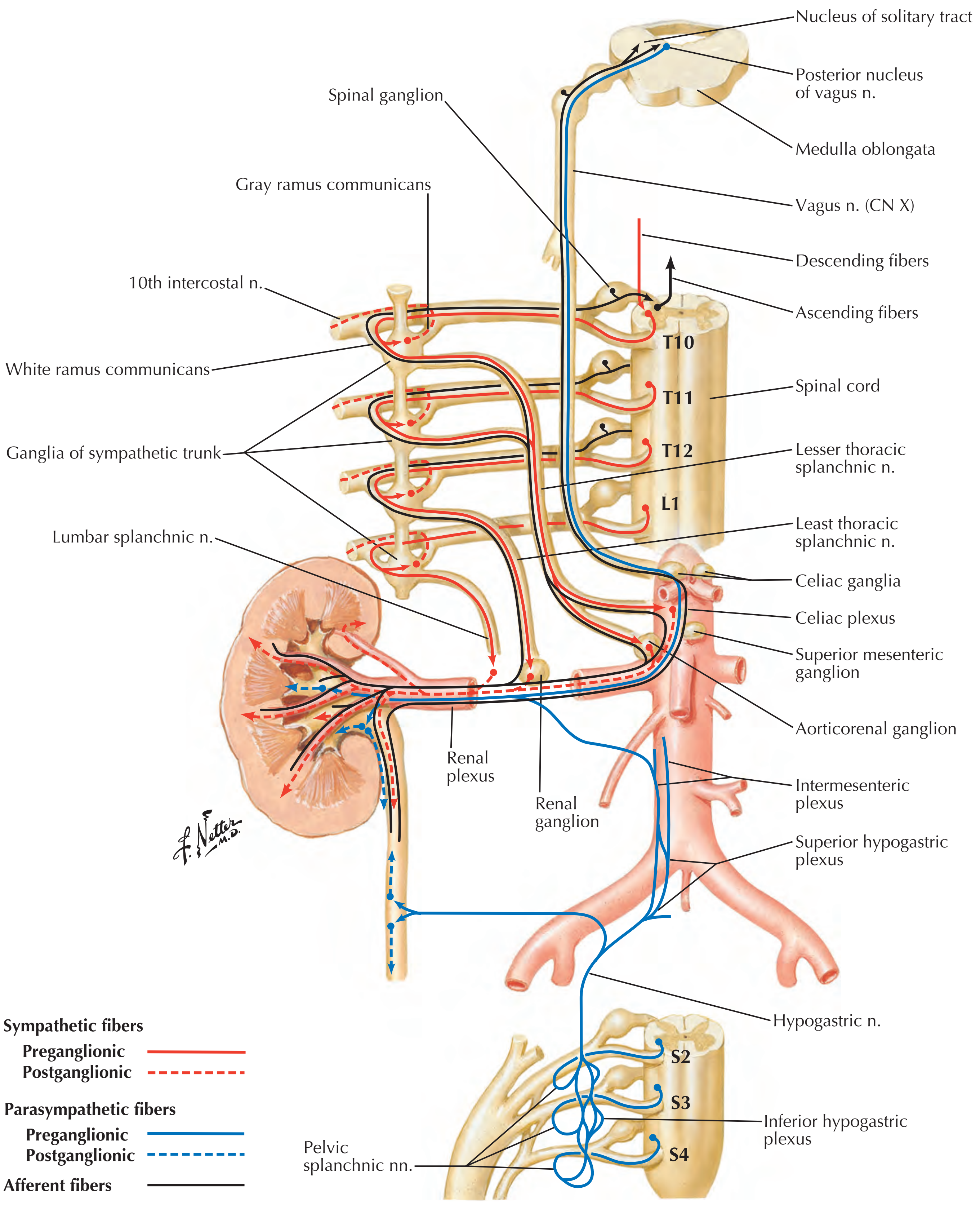
See also **Plates 408, 410**


Subcapsular lymphatic plexus
Cortical lymph vessels (along interlobular aa.)
Lymph vessels along arcuate a.
Lymph vessels along interlobar a.
Medullary lymph vessels
Note: Arrows indicate direction of flow.
F. Netter M.D.
Lumbar lymph trunks (to cisterna chyli and thoracic duct)
Lumbar nodes
Retrocaval node
Preaortic node
Precaval node
Lateral aortic node
Common iliac nodes
Promontorial (median sacral) node
Internal iliac nodes
External iliac nodes
Lymph vessels from fundus and trigone of bladder
Lymph vessels from body of bladder
Lateral vesical nodes
Prevesical nodes


Anterior vagal trunk
Posterior vagal trunk
Greater thoracic splanchnic n.
Celiac plexus
Celiac ganglia
Lesser thoracic splanchnic n.
Superior mesenteric ganglion
Least thoracic splanchnic n.
Aorticorenal ganglion
Renal ganglion
Renal plexus
Lumbar splanchnic n.
Renal and ureteric branches from intermesenteric plexus
Intermesenteric plexus
Inferior mesenteric ganglion
Sympathetic trunk
Lumbar ganglion of sympathetic trunk
Ureteric branch from common iliac plexus
Superior hypogastric plexus
Lumbosacral trunk
Sacral splanchnic nn.
Gray ramus communicans
Right and left hypogastric nn.
Sacral plexus
Pelvic splanchnic nn.
Inferior hypogastric plexus (with ureteric branches)
Rectal plexus
Vesical plexus
Prostatic plexus
F. Netter M.D.

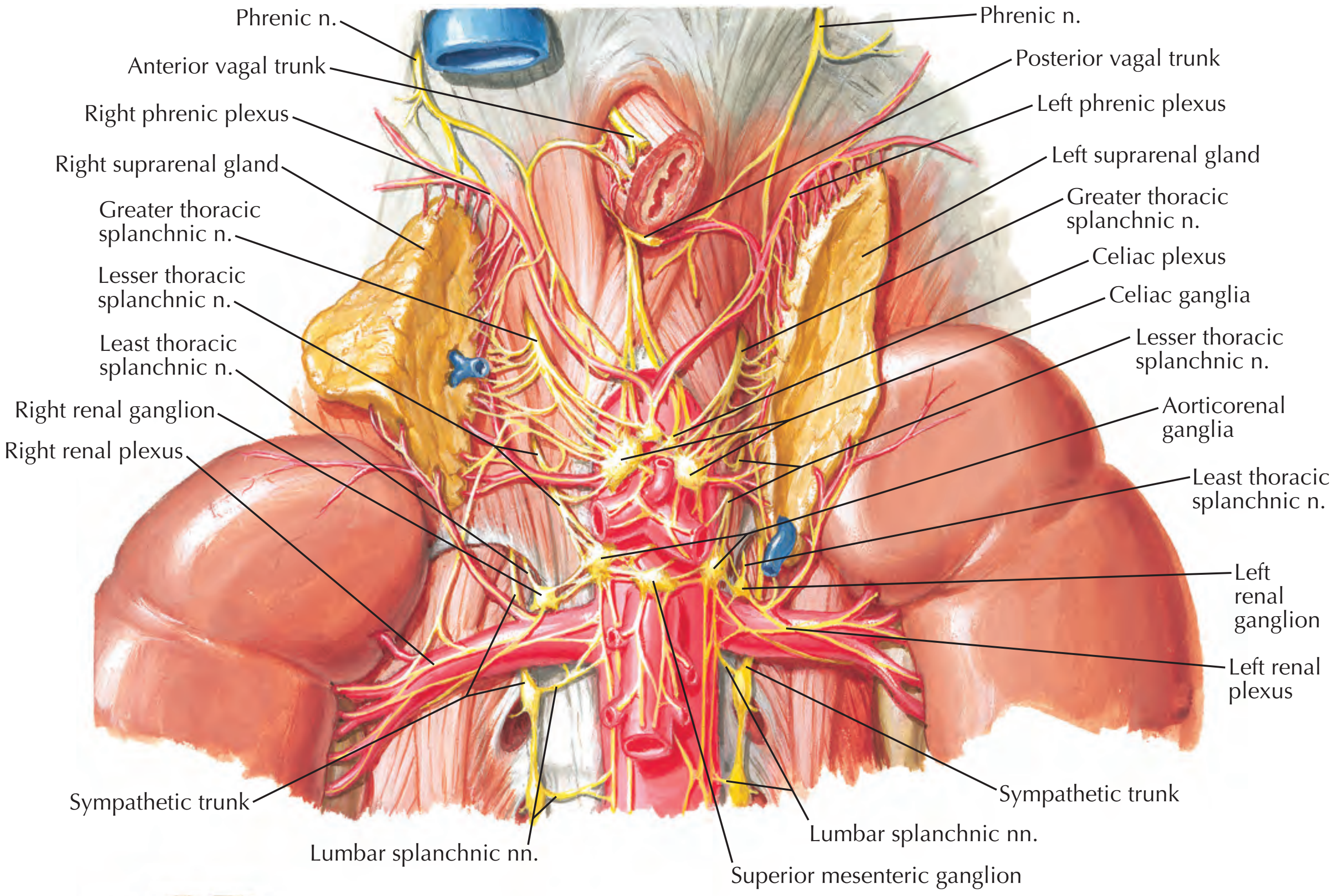
Autonomic Innervation of Kidneys and Abdominal Part of Ureters: Schema

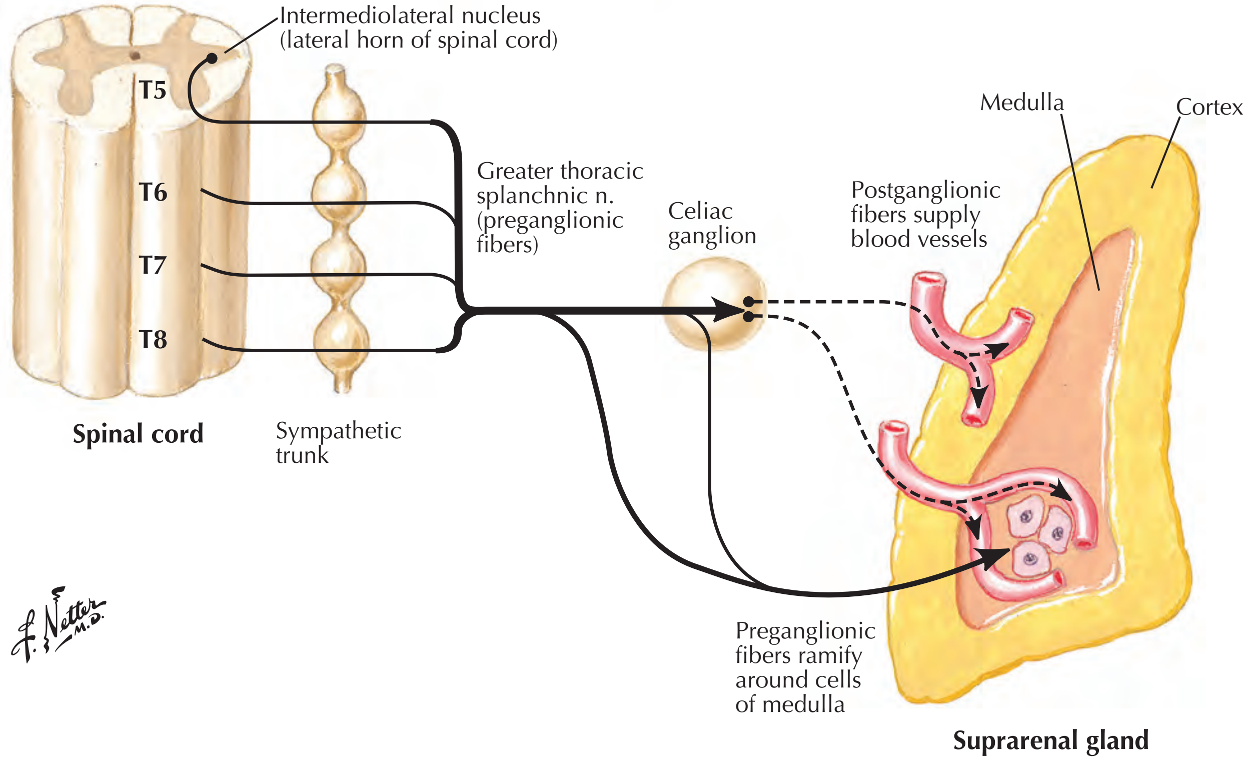
See also Plates 6, 7, 419


Nucleus of solitary tract
Posterior nucleus of vagus n.
Medulla oblongata
Spinal ganglion
Gray ramus communicans
Vagus n. (CN X)
Descending fibers
Ascending fibers
10th intercostal n.
White ramus communicans
T10
T11
Spinal cord
Ganglia of sympathetic trunk
T12
Lesser thoracic splanchnic n.
L1
Lumbar splanchnic n.
Least thoracic splanchnic n.
Celiac ganglia
Celiac plexus
Superior mesenteric ganglion
Aorticorenal ganglion
Renal plexus
Renal ganglion
Intermesenteric plexus
Superior hypogastric plexus
Hypogastric n.
S2
S3
S4
Inferior hypogastric plexus
Pelvic splanchnic nn.
Sympathetic fibers
Preganglionic
Postganglionic
Parasympathetic fibers
Preganglionic
Postganglionic
Afferent fibers

Autonomic Nerves of Suprarenal Glands: Dissection and Schema

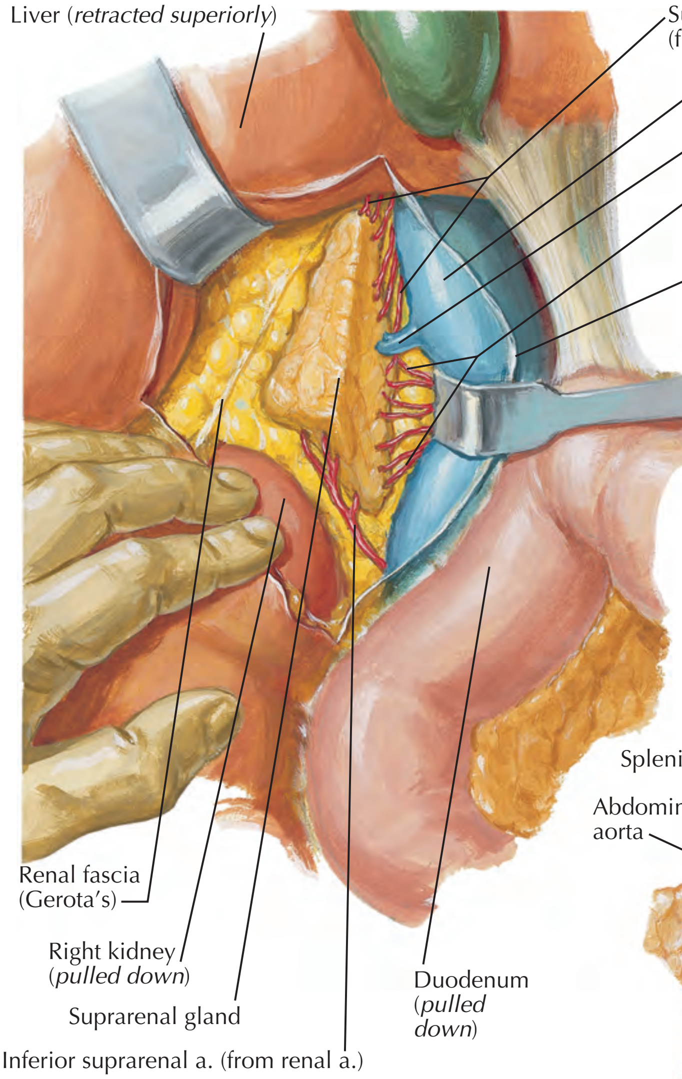
See also **Plates 6, 7, 342**


Phrenic n.
Anterior vagal trunk
Right phrenic plexus
Right suprarenal gland
Greater thoracic splanchnic n.
Lesser thoracic splanchnic n.
Least thoracic splanchnic n.
Right renal ganglion
Right renal plexus
Sympathetic trunk
Lumbar splanchnic nn.
Phrenic n.
Posterior vagal trunk
Left phrenic plexus
Left suprarenal gland
Greater thoracic splanchnic n.
Celiac plexus
Celiac ganglia
Lesser thoracic splanchnic n.
Aorticorenal ganglia
Least thoracic splanchnic n.
Left renal ganglion
Left renal plexus
Sympathetic trunk
Lumbar splanchnic nn.
Superior mesenteric ganglion

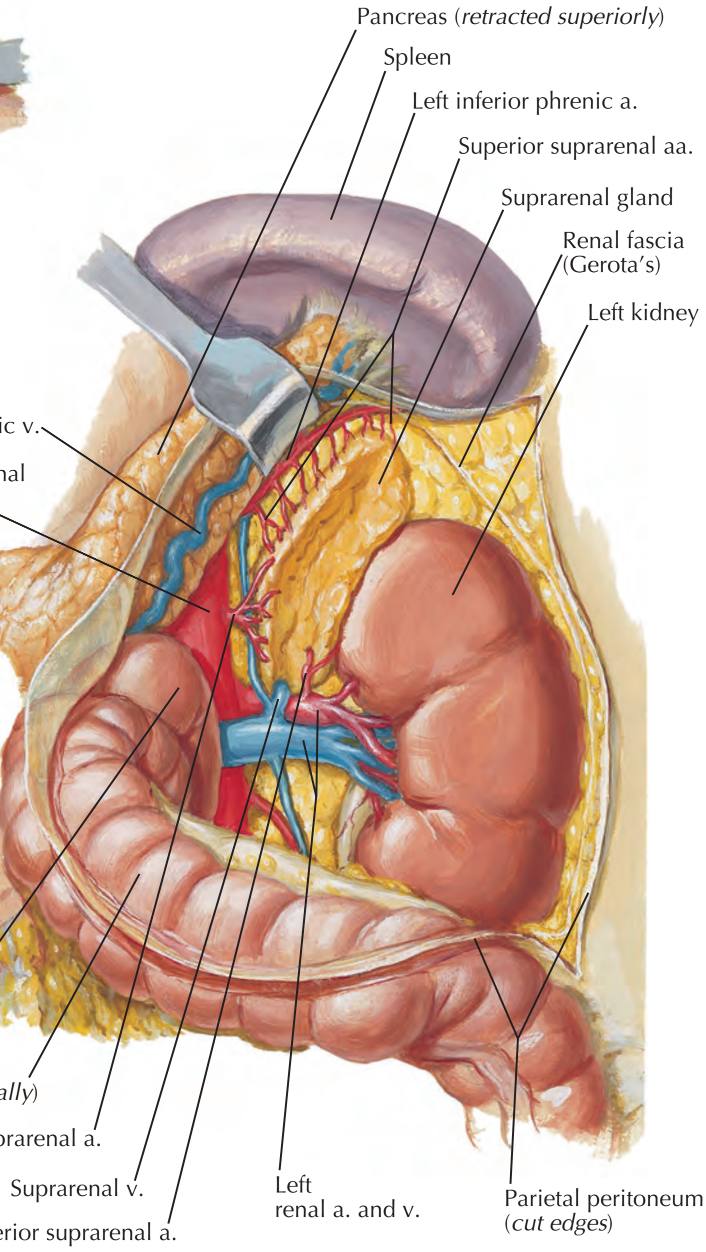

Intermediolateral nucleus (lateral horn of spinal cord)
T5
T6
T7
T8
Spinal cord
Sympathetic trunk
Greater thoracic splanchnic n. (preganglionic fibers)
Celiac ganglion
Postganglionic fibers supply blood vessels
Medulla
Cortex
Preganglionic fibers ramify around cells of medulla
Suprarenal gland

Arteries and Veins of Suprarenal Glands in Situ

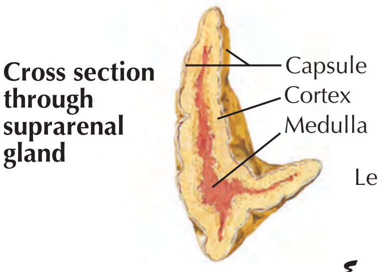
See also **Plates 332, 341**


Liver (*retracted superiorly*)
Superior suprarenal aa. (from inferior phrenic a.)
Inferior vena cava (*retracted medially*)
Suprarenal v.
Branches of middle suprarenal a. (from abdominal aorta)
Parietal peritoneum (*cut edge*)
Renal fascia (Gerota's)
Right kidney (*pulled down*)
Suprarenal gland
Inferior suprarenal a. (from renal a.)
Duodenum (*pulled down*)

Abdominal exposure of right suprarenal gland


Pancreas (*retracted superiorly*)
Spleen
Left inferior phrenic a.
Superior suprarenal aa.
Suprarenal gland
Renal fascia (Gerota's)
Left kidney
Splenic v.
Abdominal aorta
Duodeno-jejunal flexure
Left colic flexure (*pulled medially*)
Middle suprarenal a.
Suprarenal v.
Inferior suprarenal a.
Left renal a. and v.
Parietal peritoneum (*cut edges*)

Abdominal exposure of left suprarenal gland


Capsule
Cortex
Medulla

Cross section through suprarenal gland

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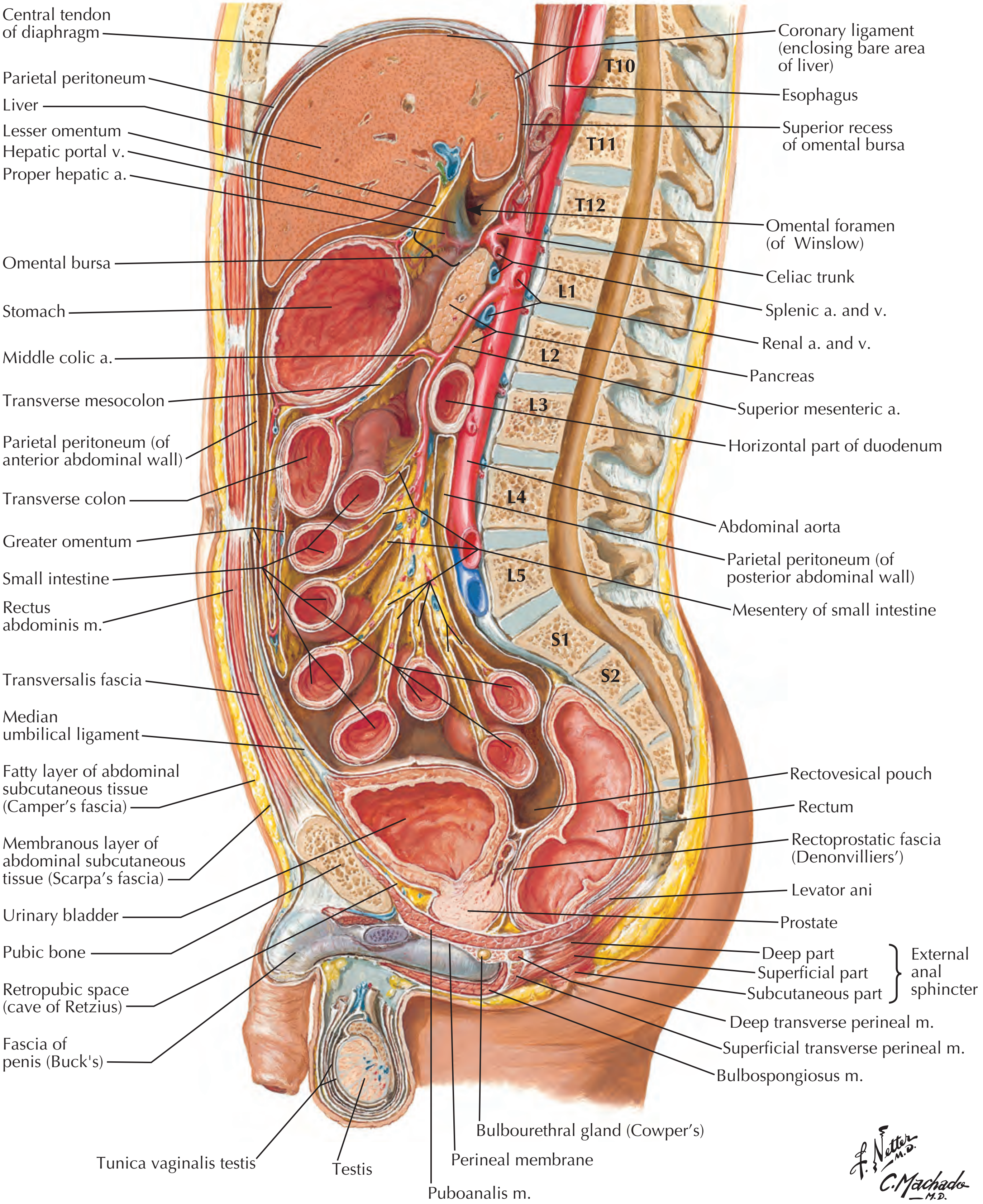
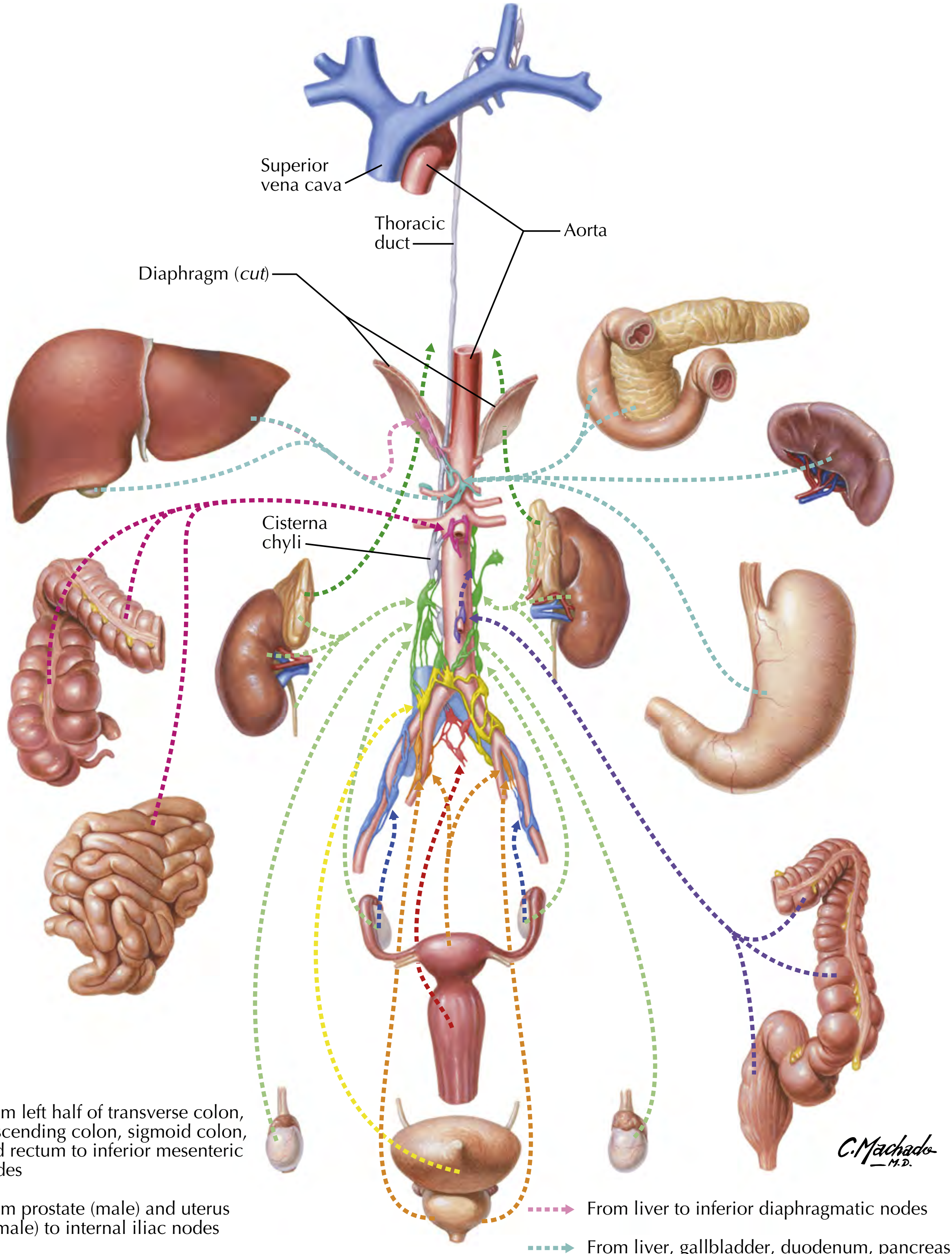
Abdominal Wall and Viscera: Paramedian Section


Central tendon of diaphragm
Parietal peritoneum
Liver
Lesser omentum
Hepatic portal v.
Proper hepatic a.
Omental bursa
Stomach
Middle colic a.
Transverse mesocolon
Parietal peritoneum (of anterior abdominal wall)
Transverse colon
Greater omentum
Small intestine
Rectus abdominis m.
Transversalis fascia
Median umbilical ligament
Fatty layer of abdominal subcutaneous tissue (Camper's fascia)
Membranous layer of abdominal subcutaneous tissue (Scarpa's fascia)
Urinary bladder
Pubic bone
Retropubic space (cave of Retzius)
Fascia of penis (Buck's)
Tunica vaginalis testis
Testis
Puboanalis m.
Perineal membrane
Bulbourethral gland (Cowper's)
Coronary ligament (enclosing bare area of liver)
Esophagus
Superior recess of omental bursa
Omental foramen (of Winslow)
Celiac trunk
Splenic a. and v.
Renal a. and v.
Pancreas
Superior mesenteric a.
Horizontal part of duodenum
Abdominal aorta
Parietal peritoneum (of posterior abdominal wall)
Mesentery of small intestine
Rectovesical pouch
Rectum
Rectoprostatic fascia (Denonvilliers')
Levator ani
Prostate
Deep part
Superficial part
Subcutaneous part
External anal sphincter
Deep transverse perineal m.
Superficial transverse perineal m.
Bulbospongiosus m.
T10
T11
T12
L1
L2
L3
L4
L5
S1
S2
F. Netter M.D.
C. Machado M.D.


Superior vena cava
Thoracic duct
Aorta
Diaphragm (*cut*)
Cisterna chyli
C. Machado M.D.

⇢ From left half of transverse colon, descending colon, sigmoid colon, and rectum to inferior mesenteric nodes

⇢ From prostate (male) and uterus (female) to internal iliac nodes

⇢ From urinary bladder to common iliac nodes

⇢ From vagina to sacral nodes

⇢ From ovaries to external iliac nodes

⇢ From suprarenal glands to posterior mediastinal nodes

⇢ From liver to inferior diaphragmatic nodes

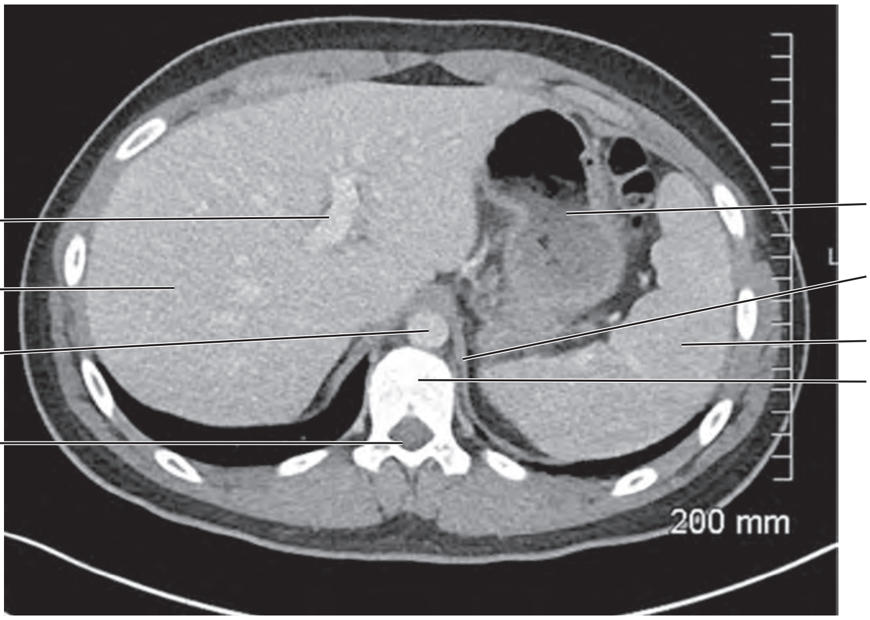
⇢ From liver, gallbladder, duodenum, pancreas, and spleen to celiac nodes

⇢ From jejunum, ileum, cecum, ascending colon, and right half of transverse colon to superior mesenteric nodes

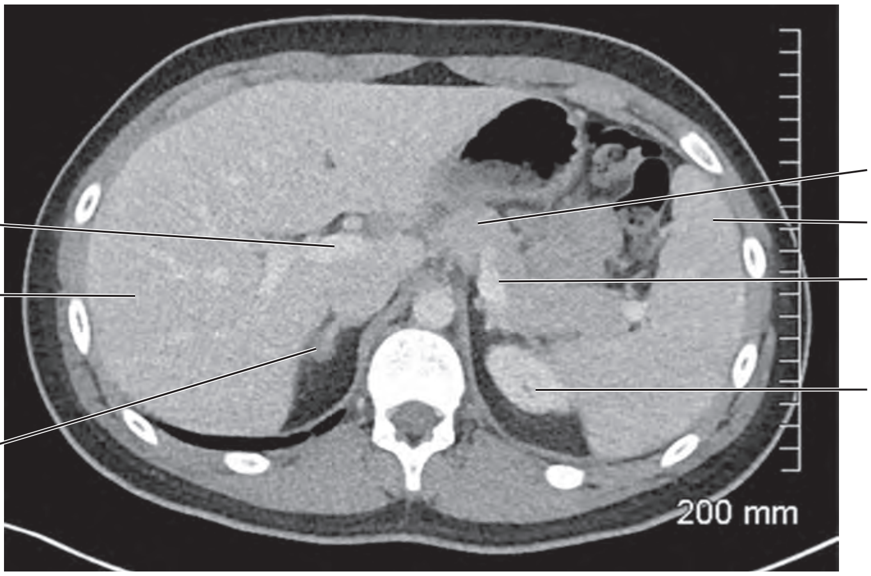
⇢ From kidneys, suprarenal glands, ureters, testes (male), and ovaries (female) to lumbar nodes

Abdominal Scans: Axial CT Images

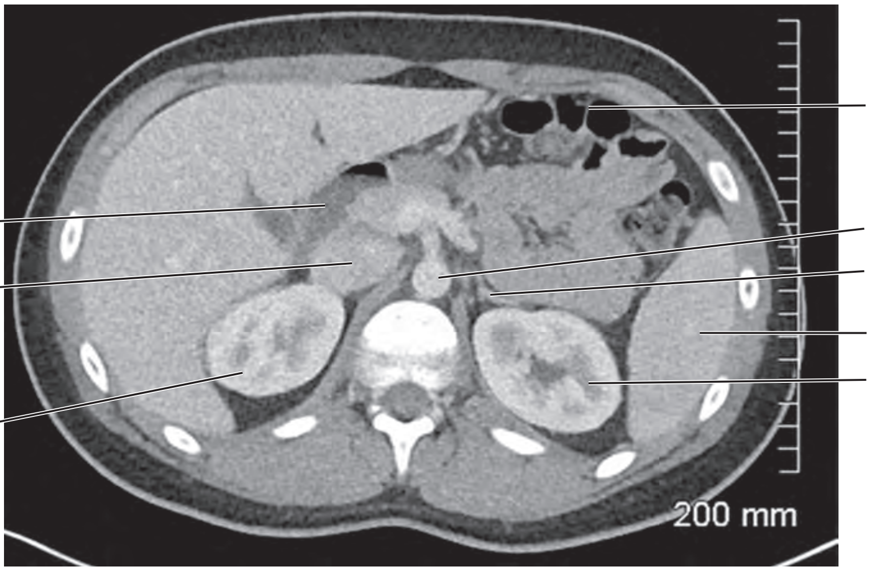
Axial CT image of abdomen with intravenous contrast enhancement


Hepatic portal v.
Liver
Descending aorta
Spinal canal
Stomach
Left crus of diaphragm
Spleen
Vertebral body
200 mm

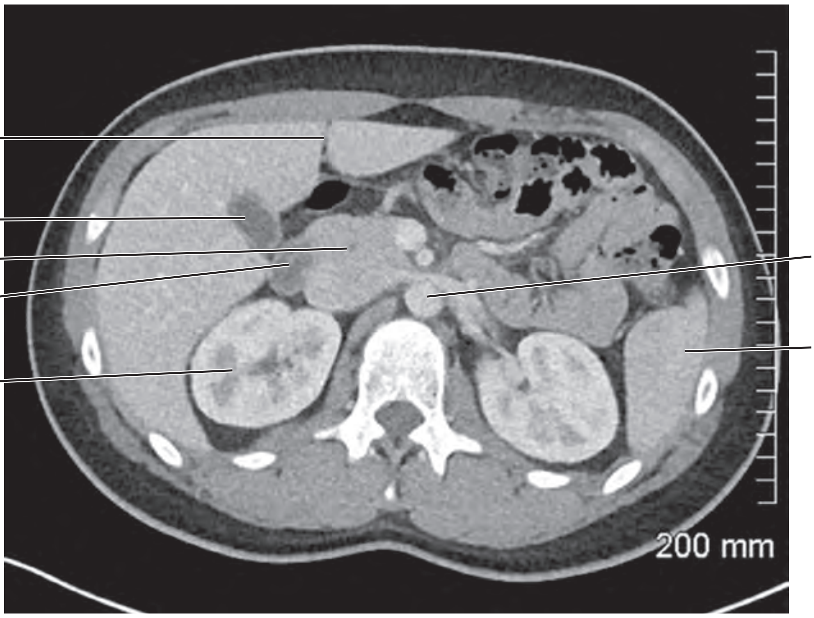
Axial CT image of upper abdomen with intravenous contrast enhancement


Hepatic portal v.
Liver
Right suprarenal gland
Body of pancreas
Spleen
Splenic v.
Left kidney
200 mm

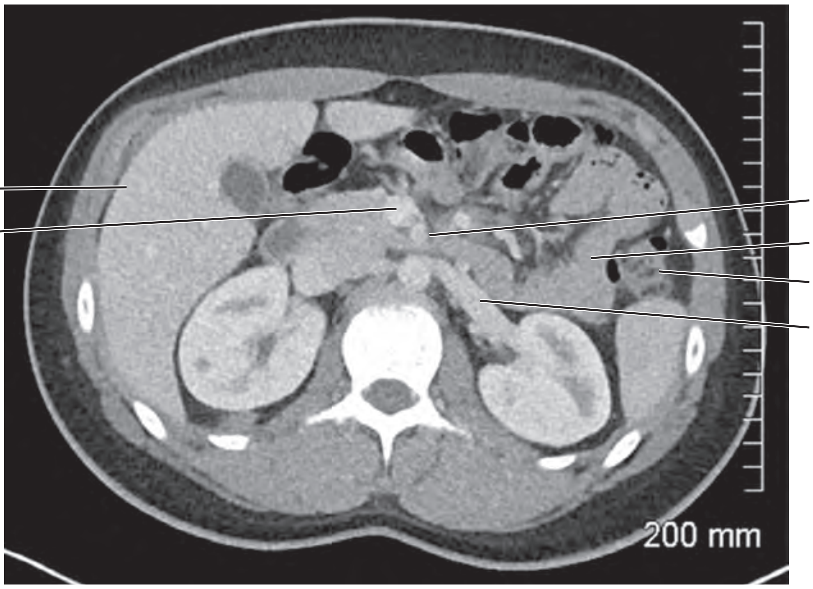
Axial CT image of midabdomen with intravenous contrast enhancement


Duodenum
Inferior vena cava
Right kidney
Left colic flexure
Abdominal aorta
Left suprarenal gland
Spleen
Left kidney
200 mm

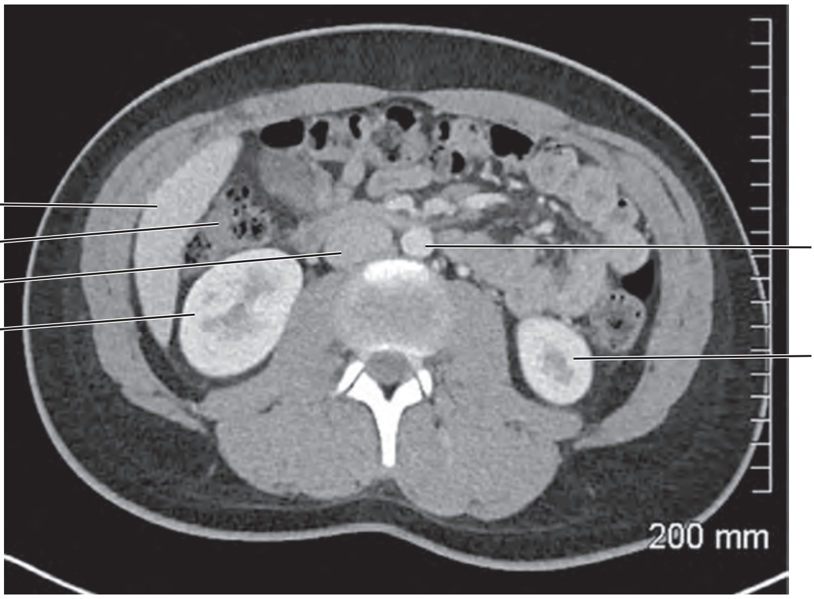
Axial CT image of midabdomen with intravenous contrast enhancement


Falciform ligament
Gallbladder
Head of pancreas
Duodenum
Right kidney
Abdominal aorta
Spleen
200 mm

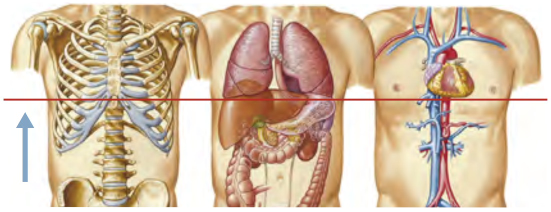
Axial CT image of abdomen with intravenous contrast enhancement

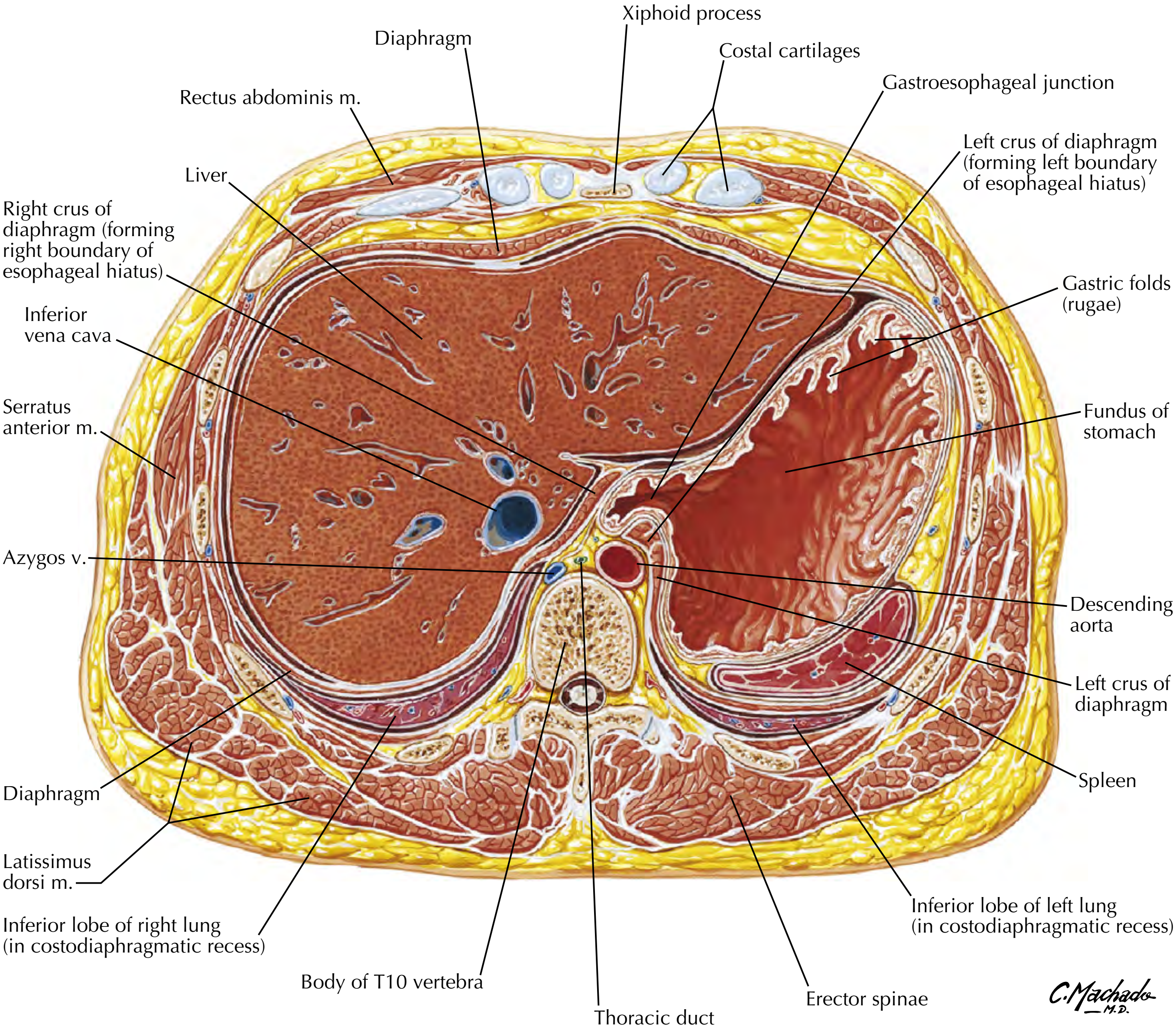

Liver
Superior mesenteric v.
Superior mesenteric a.
Jejunum
Descending colon
Left renal v.
200 mm

Axial CT image of abdomen with intravenous contrast enhancement


Right lobe of liver
Right colic flexure
Inferior vena cava
Right kidney
Abdominal aorta
Left kidney
200 mm

Cross Section at T10 Vertebral Level, Through Esophagogastric Junction




Xiphoid process
Diaphragm
Costal cartilages
Rectus abdominis m.
Gastroesophageal junction
Liver
Left crus of diaphragm (forming left boundary of esophageal hiatus)
Right crus of diaphragm (forming right boundary of esophageal hiatus)
Gastric folds (rugae)
Inferior vena cava
Serratus anterior m.
Fundus of stomach
Azygos v.
Descending aorta
Left crus of diaphragm
Spleen
Diaphragm
Latissimus dorsi m.
Inferior lobe of left lung (in costodiaphragmatic recess)
Inferior lobe of right lung (in costodiaphragmatic recess)
Body of T10 vertebra
Erector spinae
Thoracic duct
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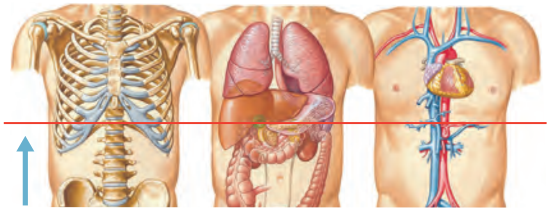
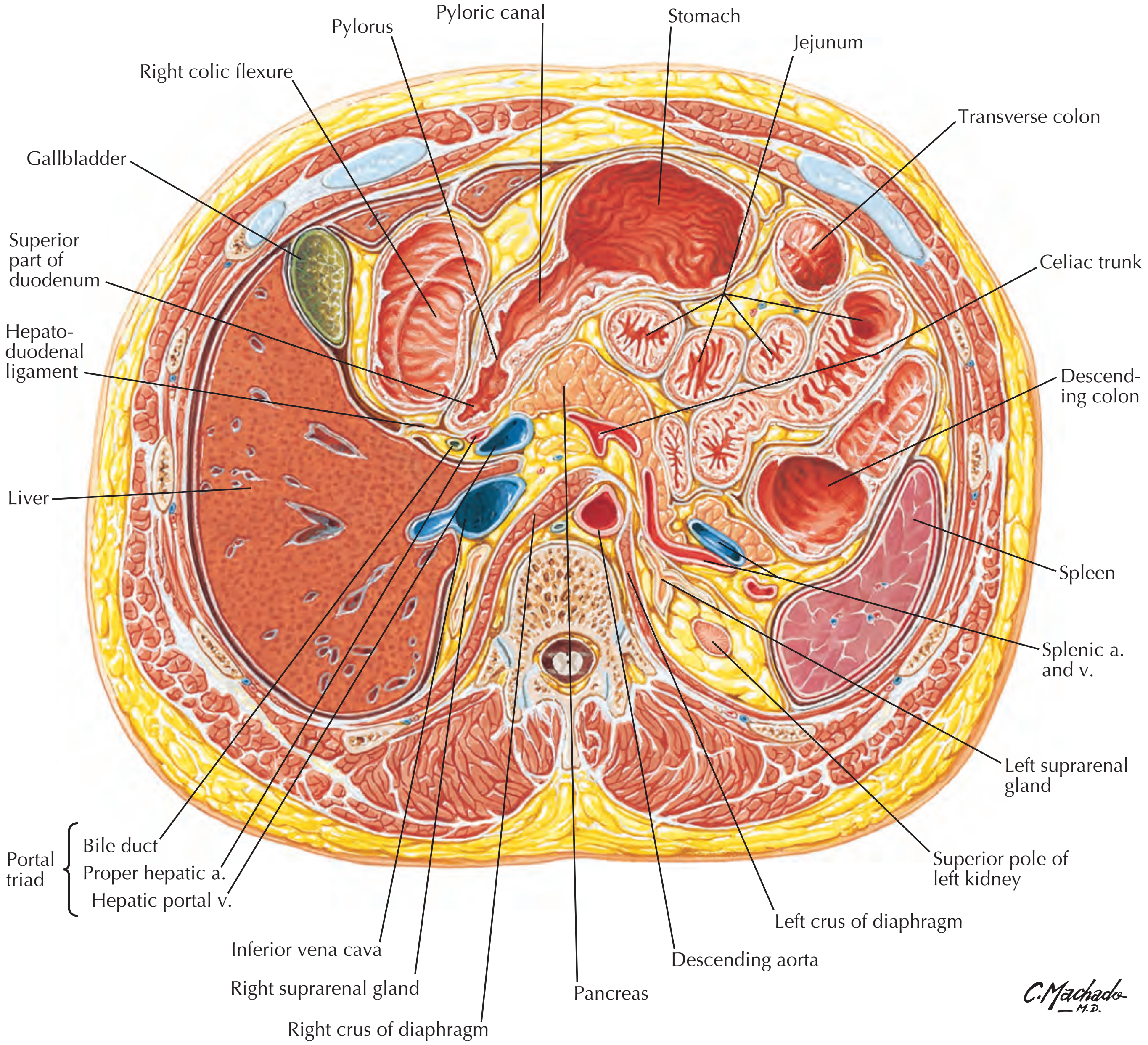
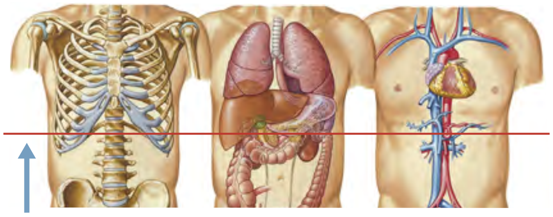
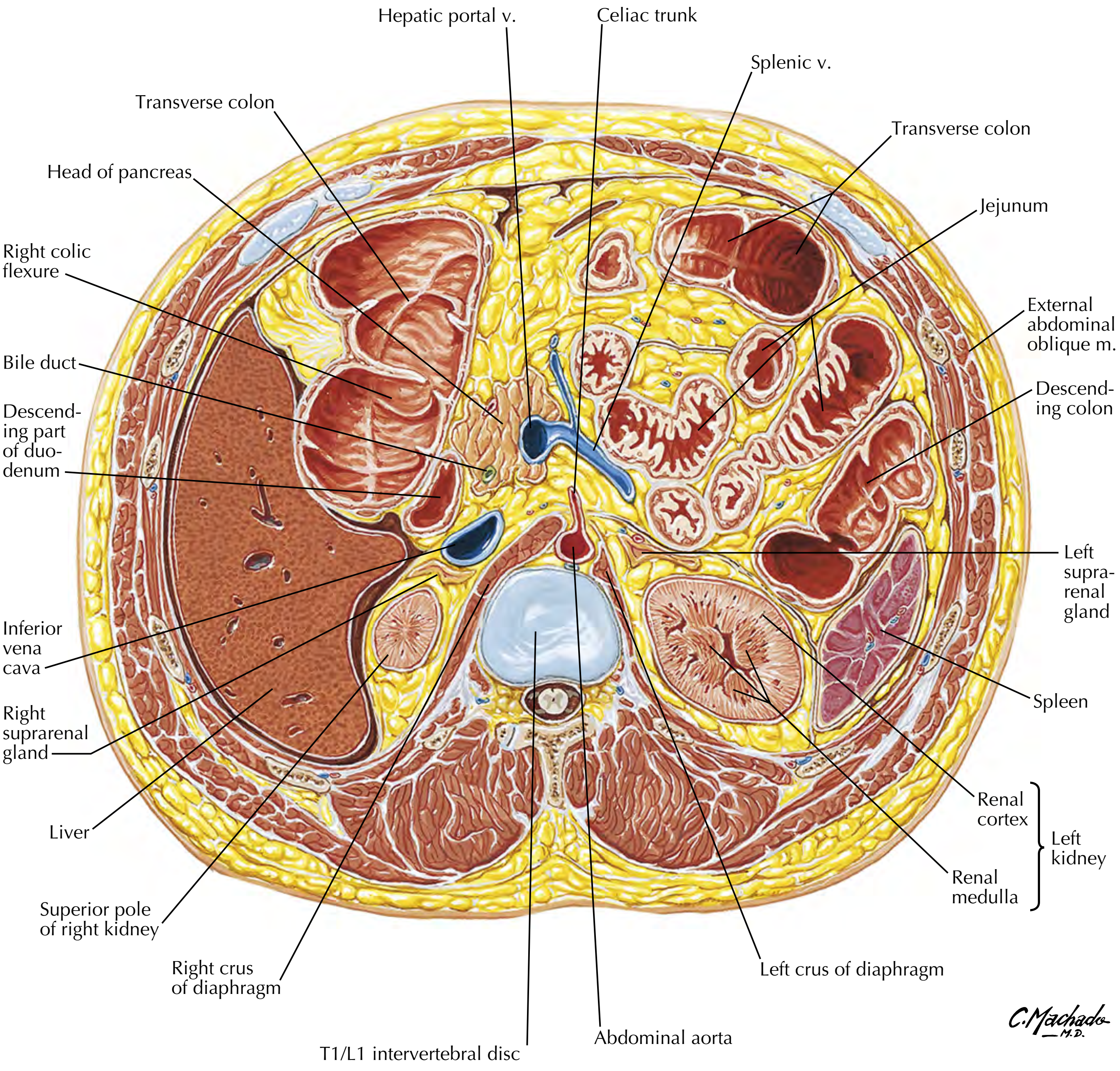



Pyloric canal
Pylorus
Stomach
Jejunum
Right colic flexure
Transverse colon
Gallbladder
Celiac trunk
Superior part of duodenum
Hepato-duodenal ligament
Descending colon
Liver
Spleen
Splenic a. and v.
Left suprarenal gland
Portal triad
Bile duct
Proper hepatic a.
Hepatic portal v.
Superior pole of left kidney
Left crus of diaphragm
Inferior vena cava
Descending aorta
Right suprarenal gland
Pancreas
Right crus of diaphragm
C. Machado M.D.

Cross Section at T12/L1 Disc Level

See also **Plate BP 79**




Hepatic portal v.
Celiac trunk
Splenic v.
Transverse colon
Transverse colon
Head of pancreas
Jejunum
Right colic flexure
External abdominal oblique m.
Bile duct
Descend- ing colon
Descend- ing part of duo- denum
Left supra- renal gland
Inferior vena cava
Spleen
Right suprarenal gland
Liver
Renal cortex
Left kidney
Renal medulla
Superior pole of right kidney
Right crus of diaphragm
Left crus of diaphragm
Abdominal aorta
T1/L1 intervertebral disc
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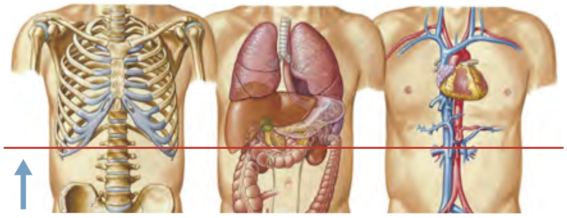

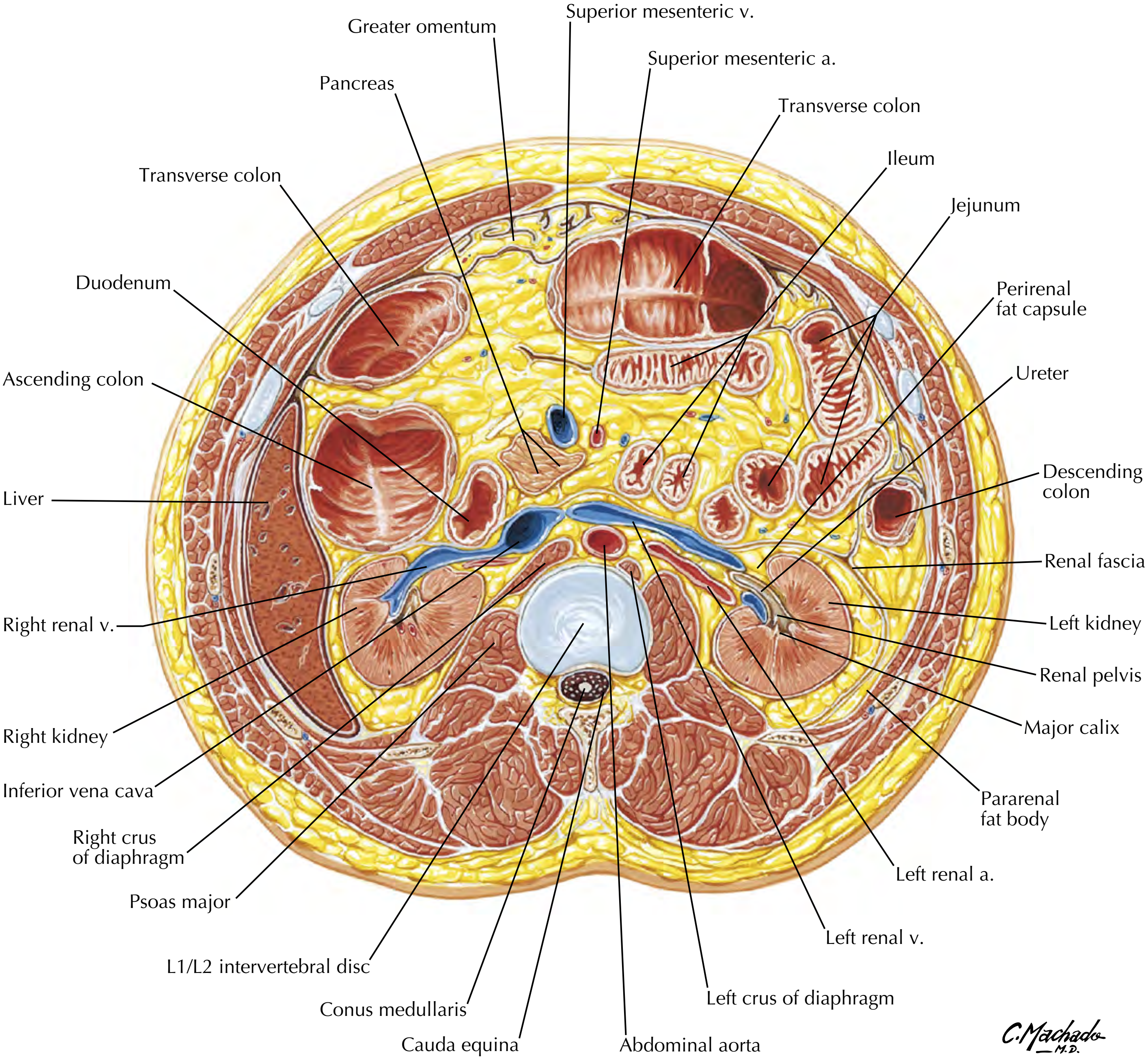
Superior mesenteric v.
Greater omentum
Superior mesenteric a.
Pancreas
Transverse colon
Ileum
Transverse colon
Jejunum
Duodenum
Perirenal fat capsule
Ascending colon
Ureter
Liver
Descending colon
Renal fascia
Right renal v.
Left kidney
Renal pelvis
Right kidney
Major calix
Inferior vena cava
Pararenal fat body
Right crus of diaphragm
Left renal a.
Psoas major
Left renal v.
L1/L2 intervertebral disc
Left crus of diaphragm
Conus medullaris
Cauda equina
Abdominal aorta
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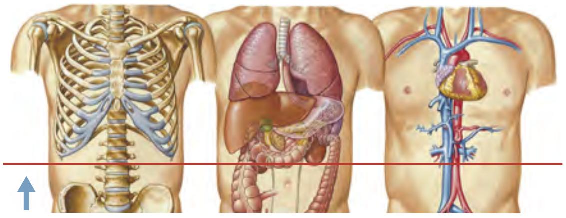

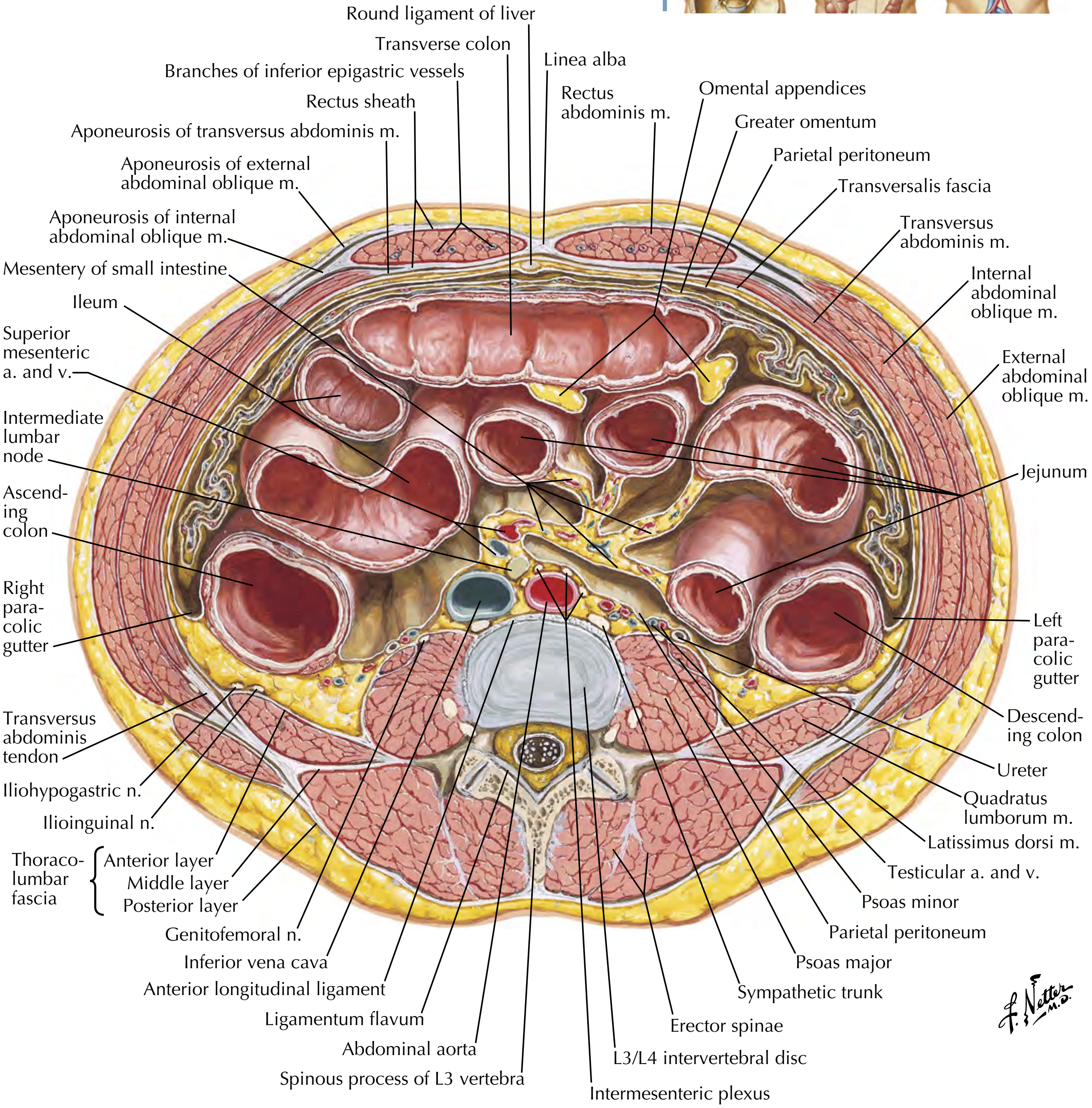
Round ligament of liver
Transverse colon
Branches of inferior epigastric vessels
Rectus sheath
Aponeurosis of transversus abdominis m.
Aponeurosis of external abdominal oblique m.
Aponeurosis of internal abdominal oblique m.
Mesentery of small intestine
Ileum
Superior mesenteric a. and v.
Intermediate lumbar node
Ascending colon
Right paracolic gutter
Transversus abdominis tendon
Iliohypogastric n.
Ilioinguinal n.
Thoracolumbar fascia
Anterior layer
Middle layer
Posterior layer
Genitofemoral n.
Inferior vena cava
Anterior longitudinal ligament
Ligamentum flavum
Abdominal aorta
Spinous process of L3 vertebra
Linea alba
Rectus abdominis m.
Omental appendices
Greater omentum
Parietal peritoneum
Transversalis fascia
Transversus abdominis m.
Internal abdominal oblique m.
External abdominal oblique m.
Jejunum
Left paracolic gutter
Descending colon
Ureter
Quadratus lumborum m.
Latissimus dorsi m.
Testicular a. and v.
Psoas minor
Parietal peritoneum
Psoas major
Sympathetic trunk
Erector spinae
L3/L4 intervertebral disc
Intermesenteric plexus
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ANATOMICAL STRUCTURE	CLINICAL COMMENT	PLATE NUMBERS
Nervous System and Sense Organs		
Ilioinguinal and genitofemoral nerves	Mediate cremasteric reflex; femoral branch of genitofemoral nerve provides cutaneous innervation to skin over femoral triangle	287
Intercostal, subcostal, and iliohypogastric nerves	Convey well-localized pain sensations from abdominal wall and parietal peritoneum; pain in dermatomal distribution indicates problem with spinal nerves (e.g., herpes zoster infection)	278
Celiac ganglion	Some patients with medically intractable pain from chronic pancreatitis or advanced pancreatic malignancy undergo celiac ganglion block; located typically at upper or lower L1 vertebral level	320, 329
Thoracic and lumbar splanchnic nerves (sympathetic)	Convey pain sensations from abdominal viscera that are often referred to other sites; quadrant in which pain is located and site of radiation provide clues to source of pain	324, 325
Iliohypogastric nerve	Nephrectomy through quadratus lumborum muscle can damage iliohypogastric nerve, with resultant anesthesia superior to the pubic symphysis	331
Skeletal System		
Xiphoid process and pubic symphysis	Palpable landmarks used to locate transpyloric plane (of Addison; L1 plane), located halfway between these structures; plane may contain pylorus of stomach, horizontal portion of duodenum, head and neck of pancreas, superior mesenteric artery, and hilum of spleen	267
Anterior superior iliac spine (ASIS)	Palpable landmark used to locate McBurney's point; tenderness over McBurney's point is indication of appendicitis	268, 300
Muscular System		
Linea alba	Site used for abdominal wall incisions because this location provides access to many organs during exploratory surgery and is unlikely to have significant vessels crossing it	267, 272
Inguinal ligament	Surface landmark from ASIS to pubic tubercle that marks division between abdomen and lower limb; formed from external abdominal oblique aponeurosis	267, 271
Inguinal (Hesselbach's) triangle	Important region on interior surface of anterior abdominal wall, bounded by inferior epigastric vessels, inguinal ligament, and rectus abdominis muscle, through which abdominal contents may herniate to produce direct inguinal hernias	274, 280
Deep inguinal ring	Slit-like opening in transversalis fascia just above midpoint of inguinal ligament and lateral to inferior epigastric artery, through which abdominal contents may herniate to produce indirect inguinal hernias	280, 281
Superficial inguinal ring	Triangular opening in external abdominal oblique aponeurosis superior and lateral to pubic tubercle and medial to inferior epigastric artery, through which abdominal contents may herniate to produce indirect inguinal hernias	270, 280, 281
Femoral ring	Superior opening of femoral canal bounded by medial part of inguinal ligament, femoral vein, and lacunar ligament; abdominal contents may herniate through femoral ring into upper femoral triangle situated inferolateral to pubic tubercle, producing femoral hernia	282
Esophageal hiatus	Widening of opening through diaphragm allows stomach to protrude into mediastinum, which can increase incidence of gastroesophageal reflux disease (GERD)	287, 289
Rectus abdominis muscle	Separation (abdominal diastasis) commonly caused from multiple pregnancies, abdominal surgeries, and excessive weight gain; bleeding of inferior epigastric artery may cause blood to accumulate in rectus abdominis muscle (rectus sheath hematoma), which may be mistaken for acute abdominal pathologies, such as appendicitis	271
Cardiovascular System		
Paraumbilical veins	May become dilated in patients with portal hypertension and in late-term pregnancy	277, 318

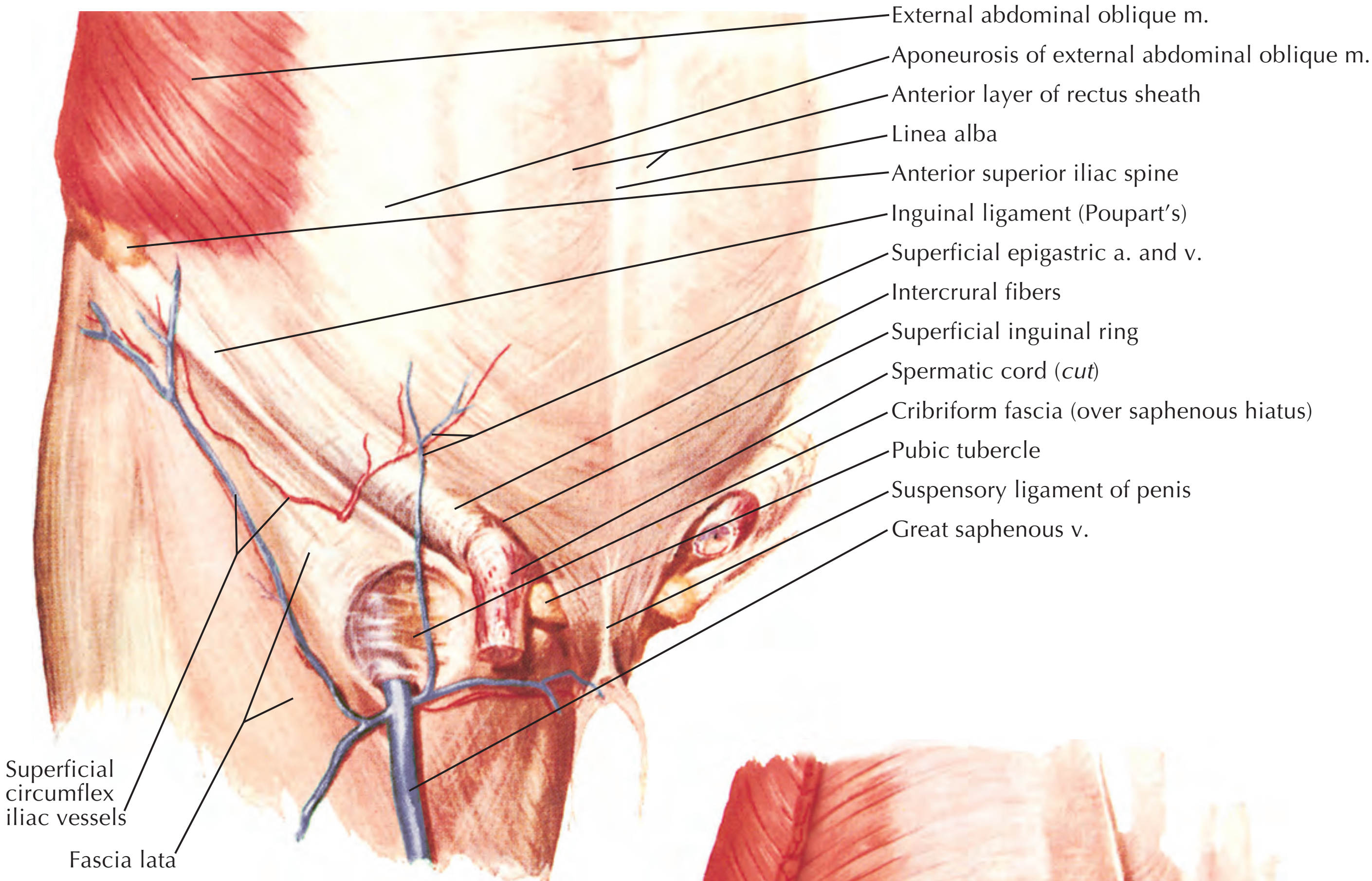
ANATOMICAL STRUCTURE	CLINICAL COMMENT	PLATE NUMBERS
Cardiovascular System—Continued		
Cystic artery	Ligated during cholecystectomy; can have multiple origins; found classically in cystohepatic triangle (of Calot)	310
Superior mesenteric artery	May compress horizontal (third) part of duodenum in thin patient or patient who has recently lost a large amount of weight; can shear or tear in sudden deceleration injuries	310, 313
Intestinal arteries	Areas without significant collateral circulation between major vessels (watershed areas) are at risk for ischemia, which can occur secondary to atherosclerosis or thromboembolism of mesenteric arteries	313, 314
Marginal artery anastomosis	Marginal artery connects right, middle, and left colic arteries, providing important anastomosis for collateral circulation	314
Esophageal veins	May become dilated in portal hypertension, resulting in esophageal varices; variceal hemorrhage can be life-threatening and often requires emergent endoscopic intervention	315, 318
Hepatic portal vein	Increased resistance to blood flow through liver (e.g., due to cirrhosis) may produce portal hypertension and dilation of tributaries of hepatic portal vein; blood may return to heart at sites of portosystemic anastomosis	317, 318
Superior anorectal (rectal) vein	Anastomoses with systemic middle and inferior anorectal veins may become dilated in portal hypertension	317, 318
Abdominal aorta	Common site for aneurysm in abdomen, especially inferior to renal arteries; assessed routinely with ultrasound to exclude aneurysms	336
Renal artery	Stenosis may occur secondary to atherosclerosis or fibromuscular dysplasia, resulting in difficult-to-control hypertension; can be affected in abdominal aortic aneurysms	334, 336
Lymph Vessels and Lymphoid Organs		
Spleen	May be ruptured by fracture of ribs 10 to 12; enlargement (splenomegaly) may occur in cirrhosis, viral infections, and hematologic malignancies; if palpable, the spleen is enlarged	291, 307
Digestive System		
Liver	Palpable inferior to right costal margin; hepatomegaly may occur in conditions such as hepatitis, heart failure, and infiltrative diseases; shrunken, nodular appearance of liver on imaging indicates cirrhosis; common site of metastasis	269, 288, 294
Gastroesophageal junction	Transient relaxations or decreased tone of lower esophageal sphincter can cause gastroesophageal reflux disease (GERD), a common cause of epigastric pain; common site of esophageal cancer	257, 295, 347
Stomach and duodenum	Primary sites of peptic ulcers; nonsteroidal anti-inflammatory drug (NSAID) overuse and/or *Helicobacter pylori* infection may cause ulceration	292, 294, 295
Pylorus	Infantile hypertrophic pyloric stenosis causes postprandial projectile vomiting among newborns	295
Major duodenal papilla (of Vater)	Catheterized and injected with contrast during endoscopic retrograde cholangiopancreatography (ERCP), a common diagnostic procedure; sphincter of hepatopancreatic ampulla (sphincter of Oddi) dysfunction may obstruct biliary flow through major duodenal papilla, resulting in right upper quadrant pain	297, 305
Vermiform appendix	Prone to inflammation and rupture (appendicitis); may have retrocecal position, in which case appendicitis causes inflammation of adjacent psoas fascia and atypical location of pain	298, 300
Colon	Common site of diverticula and malignancies; colonoscopy is performed to screen for colon cancer	301

ANATOMICAL STRUCTURE	CLINICAL COMMENT	PLATE NUMBERS
Gallbladder	May become inflamed (cholecystitis) and cause pain secondary to gallstones blocking cystic duct	302, 305, 308, 328
Bile duct	Gallstones may become impacted in bile duct (choledocholithiasis), resulting in hepatitis and jaundice; some cases may be complicated by pancreatitis and/or infection of obstructed biliary ducts (cholangitis); small stones can be problematic, whereas large stones usually remain in gallbladder and are more typically asymptomatic; ERCP is performed to locate and relieve obstruction	302, 303, 305
Umbilicus	Remnant of umbilical cord insertion into fetal umbilical vessels; landmark for locating transumbilical plane, which is used to divide abdomen into quadrants; marks position of T10 dermatome; used to locate McBurney's point; common site for hernias in abdominal wall	267, 269
Pancreas	Lies primarily retroperitoneal and deep to stomach; thus, inflamed pancreas may be compressed by stomach and cause intense pain referred to the back; inflamed pancreas, most often caused by biliary obstruction or alcohol abuse, may cause severe life-threatening complications; cancer of head/neck of pancreas can compress biliary tree	292, 306, 329
Urinary System		
Kidney	Right kidney is lower or more inferior than left kidney due to position inferior to liver; renal arteries are generally located at L2 vertebral level and may be involved in abdominal aortic aneurysms; renal calculi (kidney stones) cause significant pain when impacted in ureter	333
Renal pelvis	May become dilated secondary to ureteral or urinary bladder outlet obstruction, a condition known as hydronephrosis, which is readily visualized using ultrasound	333
Endocrine System		
Suprarenal gland	Produces hormones in its cortex (e.g., cortisol, aldosterone) and medulla (e.g., epinephrine, norepinephrine); small masses are frequently incidentally discovered on axial abdominal imaging; need for further workup depends in part on size	330

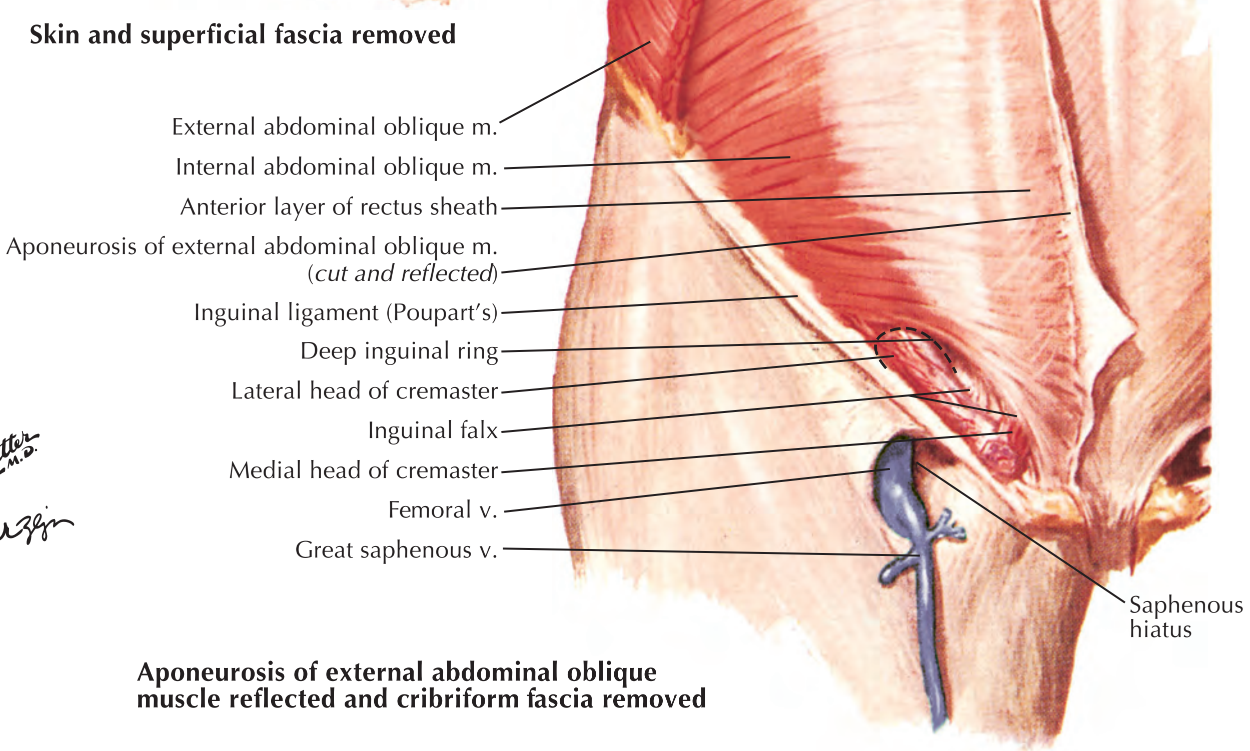
*Selections were based largely on clinical data and commonly discussed clinical correlations in macroscopic ("gross") anatomy courses.

MUSCLE	MUSCLE GROUP	ORIGIN ATTACHMENT	INSERTION ATTACHMENT	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
External abdominal oblique m.	Anterior abdominal wall	External surfaces of ribs 5–12	Linea alba, pubic tubercle, anterior half of iliac crest	Anterior rami of T7–T12 spinal nerves	Superior and inferior epigastric, and lumbar arteries	Compresses and supports abdominal viscera, flexes and rotates trunk
Internal abdominal oblique m.	Anterior abdominal wall	Thoracolumbar fascia, anterior two-thirds of iliac crest	Inferior borders of ribs 10–12, linea alba (via rectus sheath), pubic crest and pecten pubis (via conjoint tendon)	Anterior rami of T7–L1 spinal nerves	Superior and inferior epigastric, deep circumflex iliac, and lumbar arteries	Compresses and supports abdominal viscera, flexes and rotates trunk
Pyramidalis m.	Anterior abdominal wall	Body of pubis and pubic symphysis (anterior to rectus abdominis)	Linea alba (inferior to umbilicus)	Anterior ramus of T12 spinal nerve via subcostal or iliohypogastric nerves	Inferior epigastric artery	Tenses linea alba
Quadratus lumborum m.	Posterior abdominal wall	Medial half of inferior border of 12th rib, tips of transverse processes of L1–L4 vertebrae	Internal lip of iliac crest, iliolumbar ligament	Anterior rami of T12–L1 spinal nerves	Iliolumbar artery	Extends and laterally flexes vertebral column, fixes 12th rib during inspiration
Rectus abdominis m.	Anterior abdominal wall	Pubic crest, pubic symphysis	Costal cartilages 5–7, xiphoid process	Anterior rami of T7–T12 spinal nerves	Superior and inferior epigastric arteries	Flexes trunk, compresses abdominal viscera
Transversus abdominis m.	Anterior abdominal wall	Internal surfaces of costal cartilages 7–12, thoracolumbar fascia, iliac crest	Linea alba (via rectus sheath), pubic crest and pecten pubis (via conjoint tendon)	Anterior rami of T7–L1 spinal nerves	Deep circumflex iliac, inferior epigastric, and lumbar arteries	Compresses and supports abdominal viscera

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.


External abdominal oblique m.
Aponeurosis of external abdominal oblique m.
Anterior layer of rectus sheath
Linea alba
Anterior superior iliac spine
Inguinal ligament (Poupart's)
Superficial epigastric a. and v.
Intercrural fibers
Superficial inguinal ring
Spermatic cord (*cut*)
Cribriform fascia (over saphenous hiatus)
Pubic tubercle
Suspensory ligament of penis
Great saphenous v.
Superficial circumflex iliac vessels
Fascia lata

Skin and superficial fascia removed


External abdominal oblique m.
Internal abdominal oblique m.
Anterior layer of rectus sheath
Aponeurosis of external abdominal oblique m. (*cut and reflected*)
Inguinal ligament (Poupart's)
Deep inguinal ring
Lateral head of cremaster
Inguinal falx
Medial head of cremaster
Femoral v.
Great saphenous v.
Saphenous hiatus

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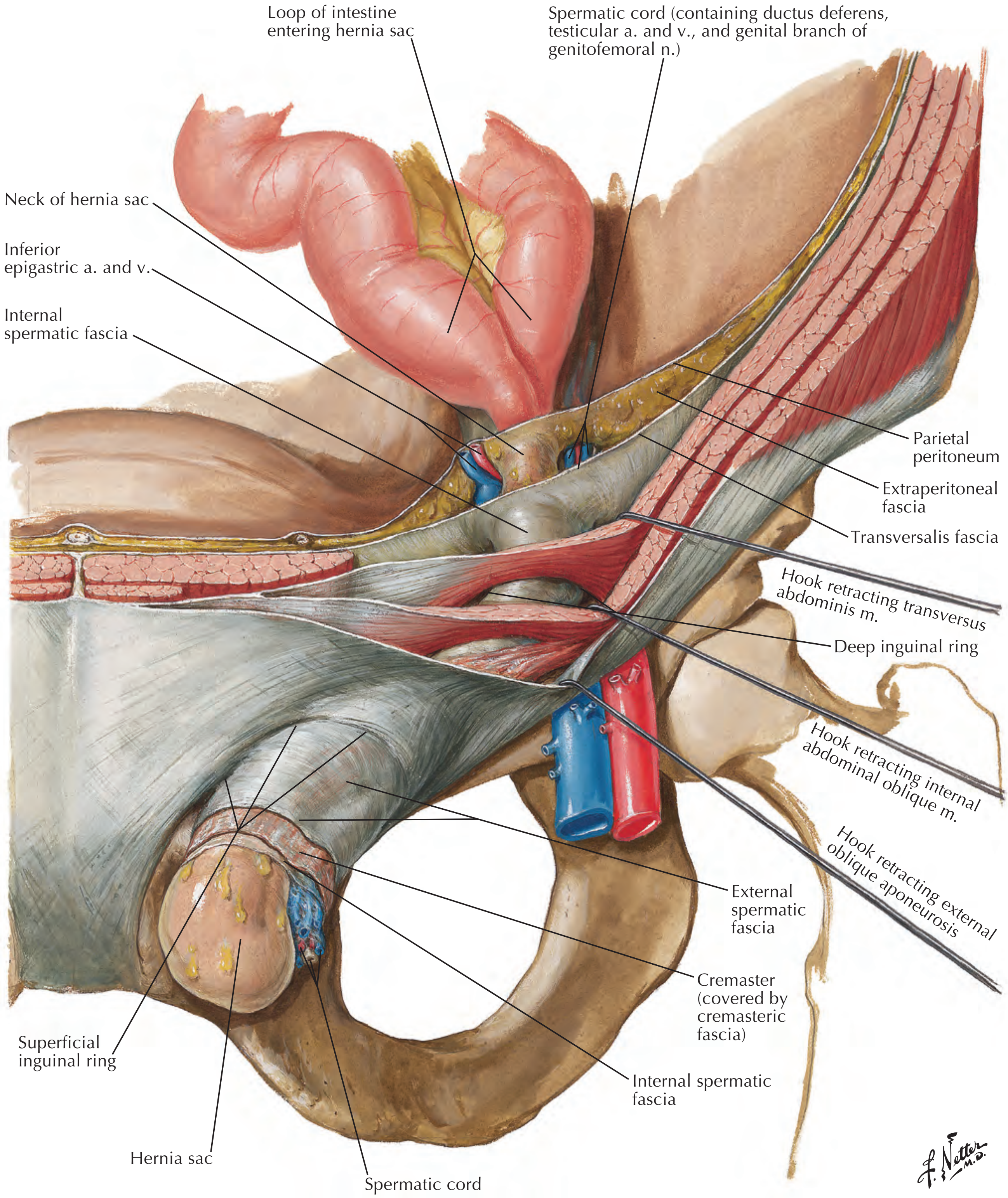
K. Marzejon

Aponeurosis of external abdominal oblique muscle reflected and cribriform fascia removed

Indirect Inguinal Hernia


Loop of intestine entering hernia sac
Spermatic cord (containing ductus deferens, testicular a. and v., and genital branch of genitofemoral n.)
Neck of hernia sac
Inferior epigastric a. and v.
Internal spermatic fascia
Parietal peritoneum
Extraperitoneal fascia
Transversalis fascia
Hook retracting transversus abdominis m.
Deep inguinal ring
Hook retracting internal abdominal oblique m.
Hook retracting external oblique aponeurosis
External spermatic fascia
Cremaster (covered by cremasteric fascia)
Internal spermatic fascia
Superficial inguinal ring
Hernia sac
Spermatic cord
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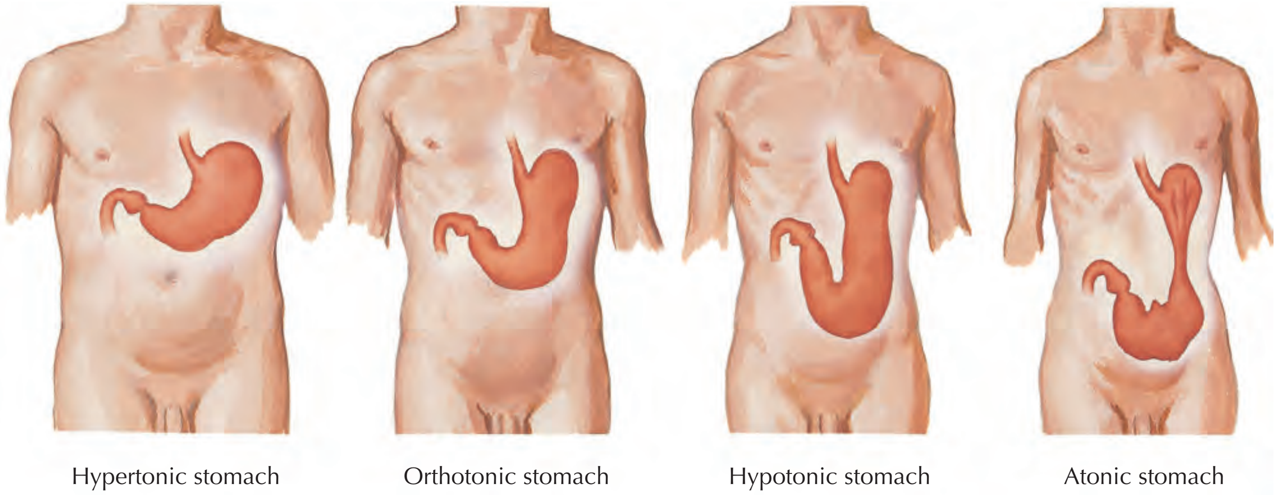
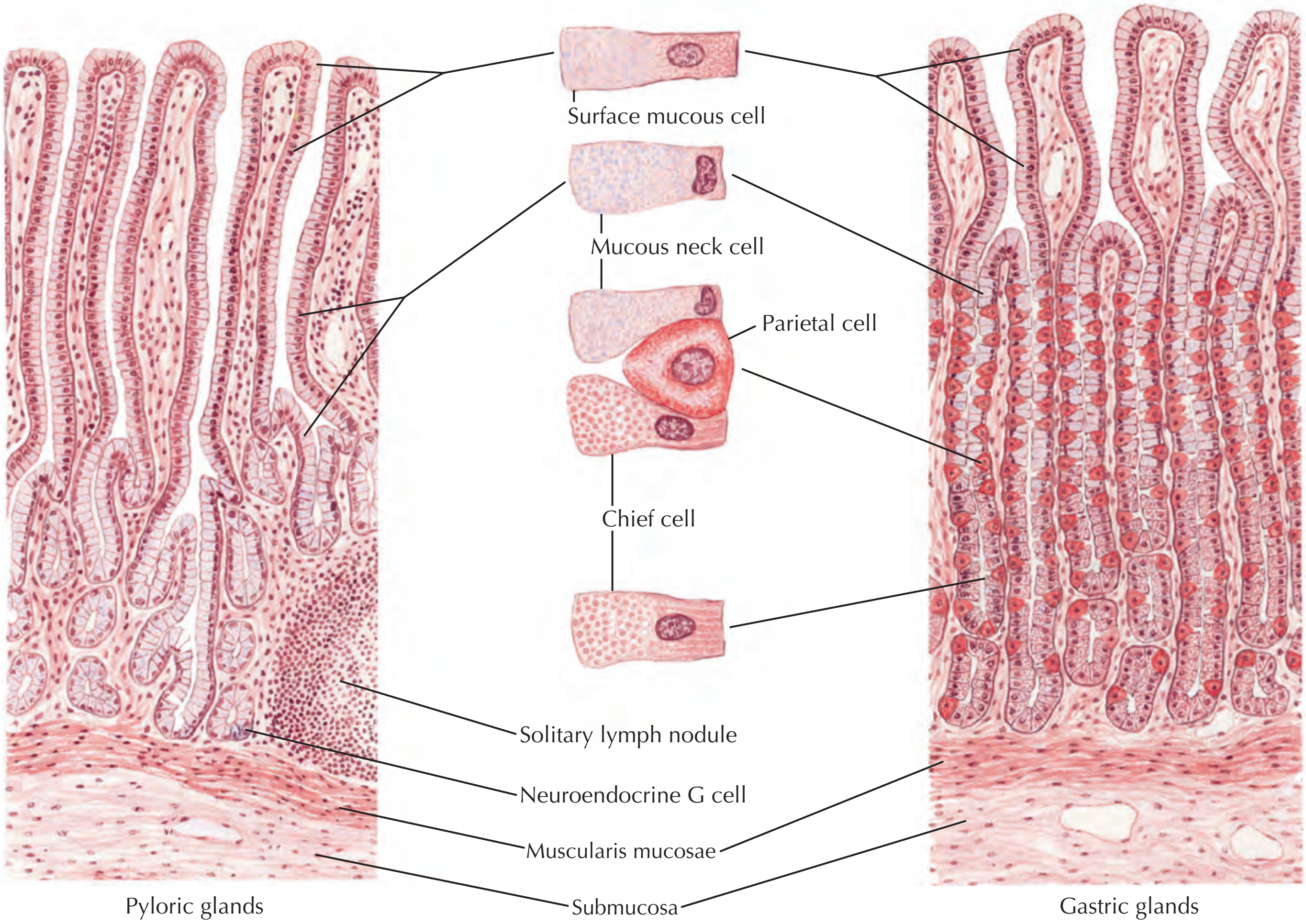
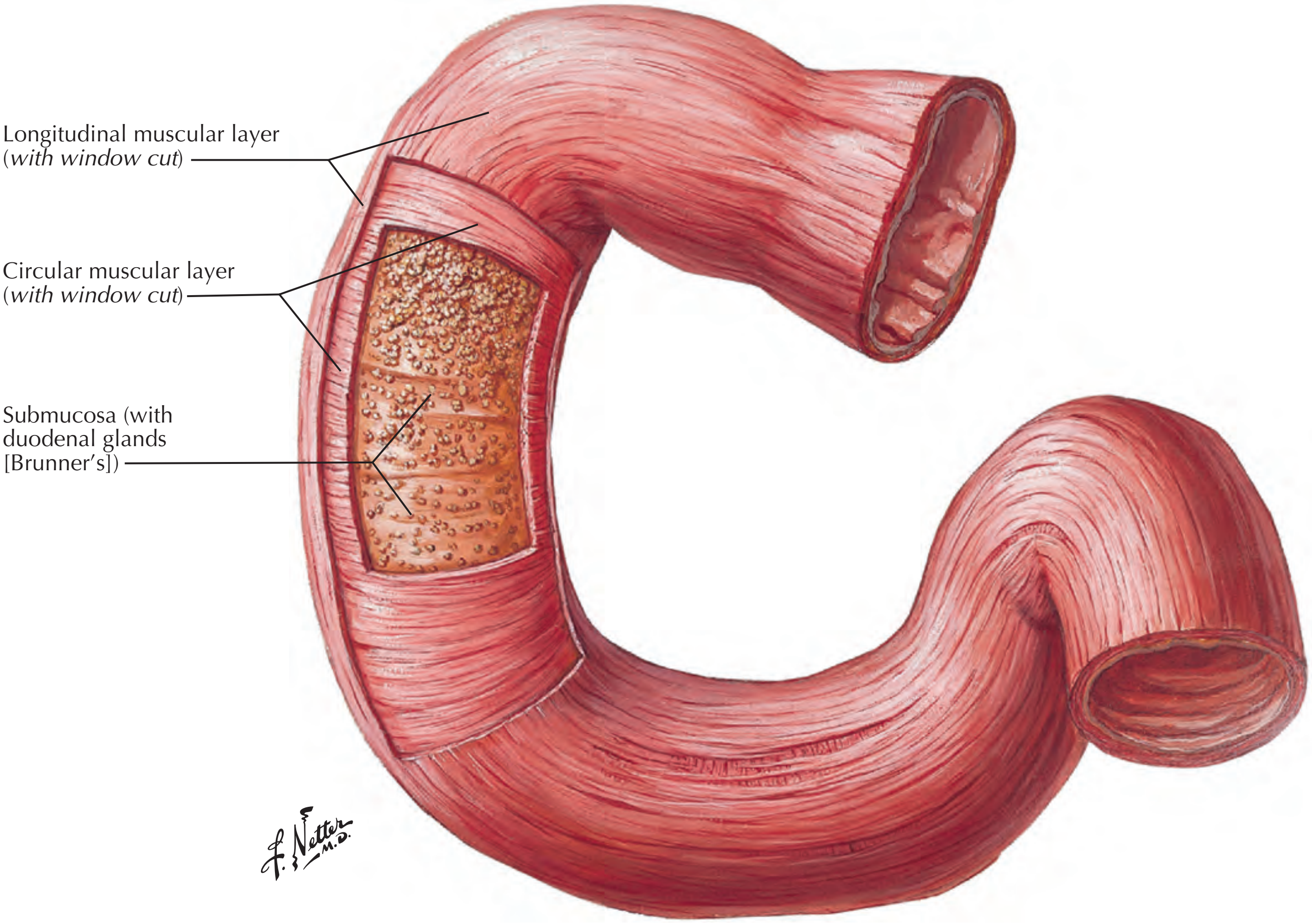
Variations in position and contour of stomach in relation to body habitus


Hypertonic stomach
Orthotonic stomach
Hypotonic stomach
Atonic stomach


Surface mucous cell
Mucous neck cell
Parietal cell
Chief cell
Solitary lymph nodule
Neuroendocrine G cell
Muscularis mucosae
Submucosa
Pyloric glands
Gastric glands


Longitudinal muscular layer (*with window cut*)
Circular muscular layer (*with window cut*)
Submucosa (with duodenal glands [Brunner's])
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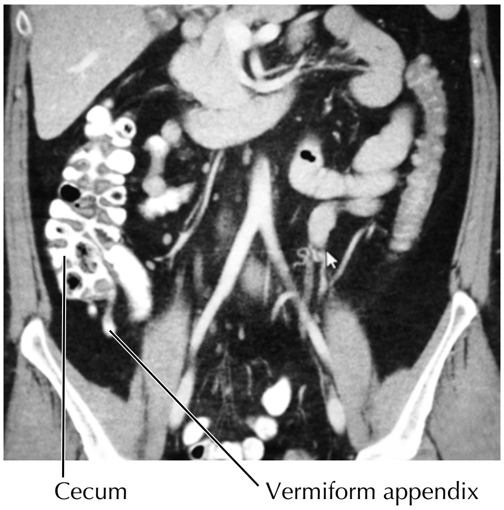
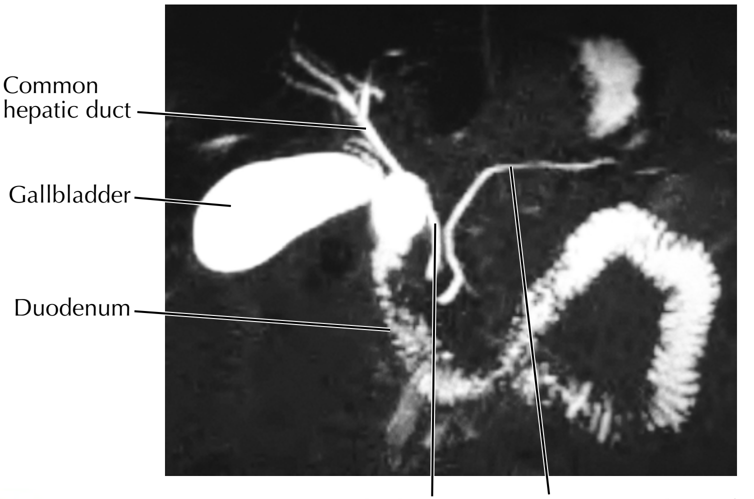
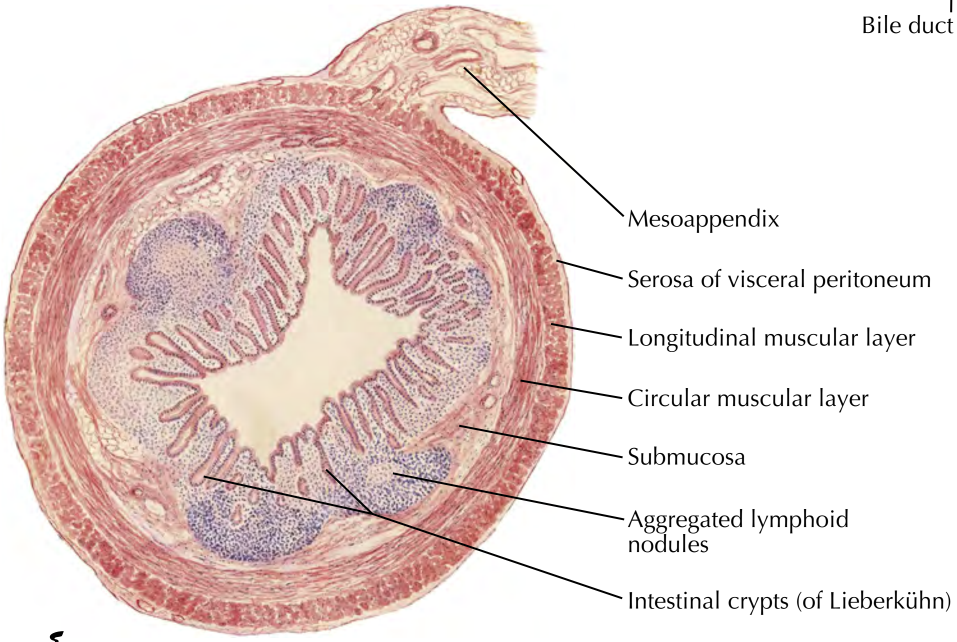
CT and MRCP Showing Vermiform Appendix, Gallbladder, and Ducts; Nerve Branches of Hepatic Artery

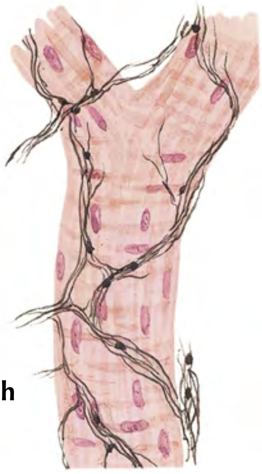
Coronal CT image with contrast


Cecum
Vermiform appendix

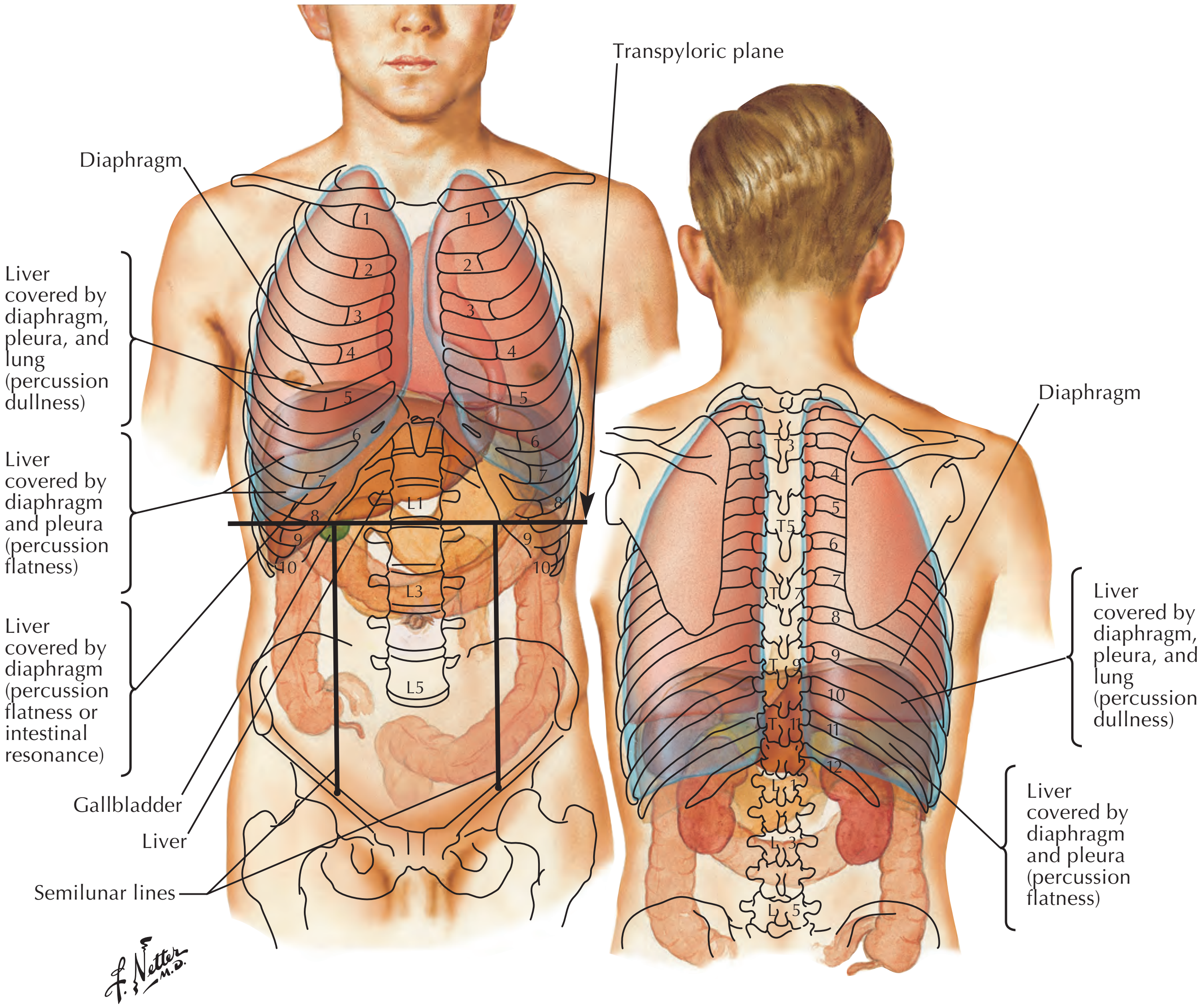
Magnetic resonance cholangiopancreatography (MRCP)


Common hepatic duct
Gallbladder
Duodenum
Bile duct
Pancreatic duct (of Wirsung)


Mesoappendix
Serosa of visceral peritoneum
Longitudinal muscular layer
Circular muscular layer
Submucosa
Aggregated lymphoid nodules
Intestinal crypts (of Lieberkühn)



Ramification of nerve fibers around fine branch of hepatic artery


Transpyloric plane
Diaphragm
Liver covered by diaphragm, pleura, and lung (percussion dullness)
Liver covered by diaphragm and pleura (percussion flatness)
Liver covered by diaphragm (percussion flatness or intestinal resonance)
Gallbladder
Liver
Semilunar lines
1
2
3
4
5
6
7
8
9
10
L1
L3
L5
Diaphragm
Liver covered by diaphragm, pleura, and lung (percussion dullness)
Liver covered by diaphragm and pleura (percussion flatness)
T3
T5
T7
T9
T11
L1
L3
L5
4
5
6
7
8
9
10
11
12
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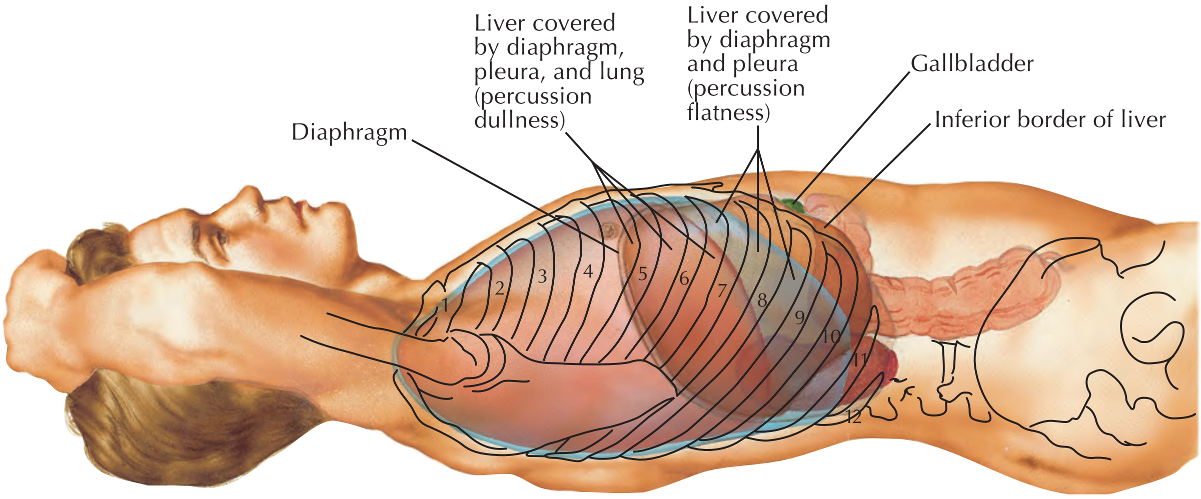
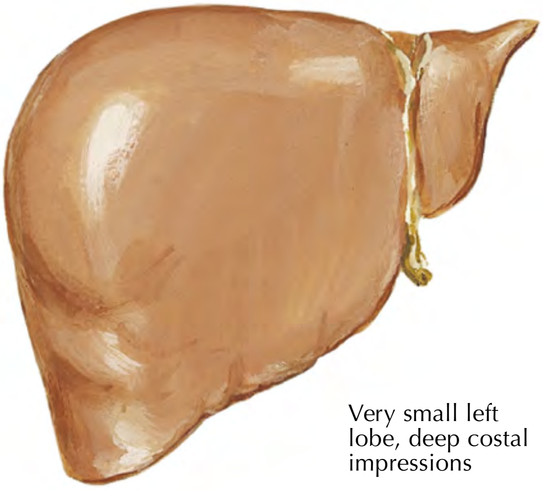
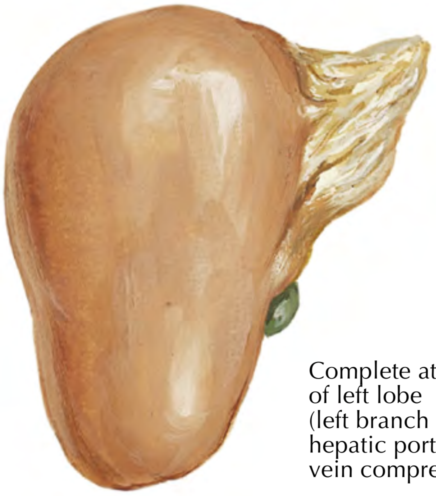

Diaphragm
Liver covered by diaphragm, pleura, and lung (percussion dullness)
Liver covered by diaphragm and pleura (percussion flatness)
Gallbladder
Inferior border of liver
1
2
3
4
5
6
7
8
9
10
11
12

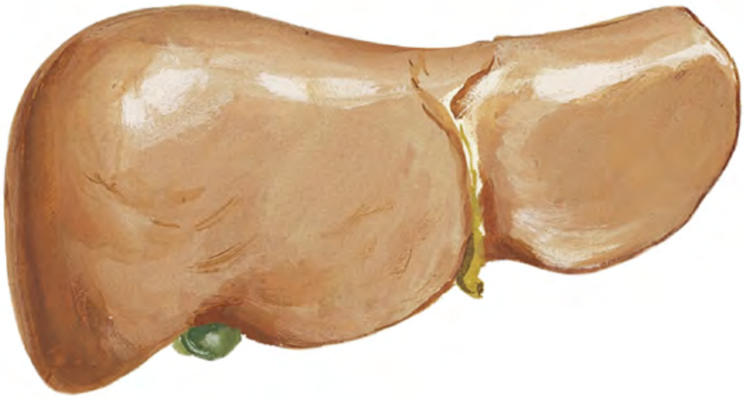
Variations in Form of Liver



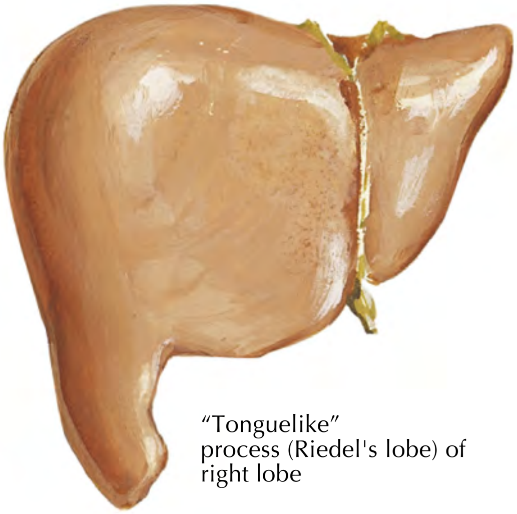
Very small left lobe, deep costal impressions



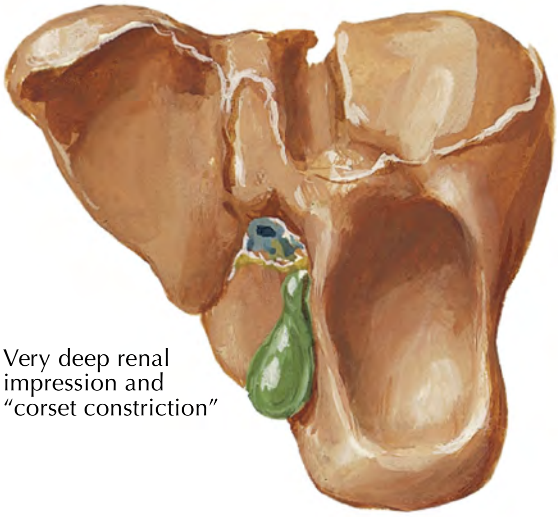
Complete atrophy of left lobe (left branch of hepatic portal vein compression)



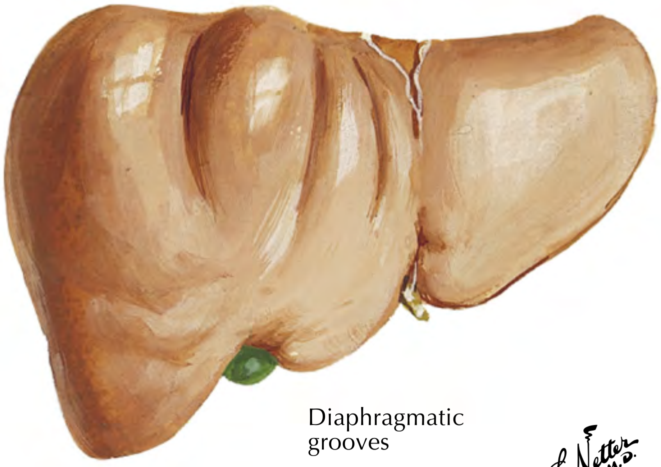
Transverse, “saddlelike” liver, relatively large left lobe



“Tonguelike” process (Riedel's lobe) of right lobe



Very deep renal impression and “corset constriction”



Diaphragmatic grooves

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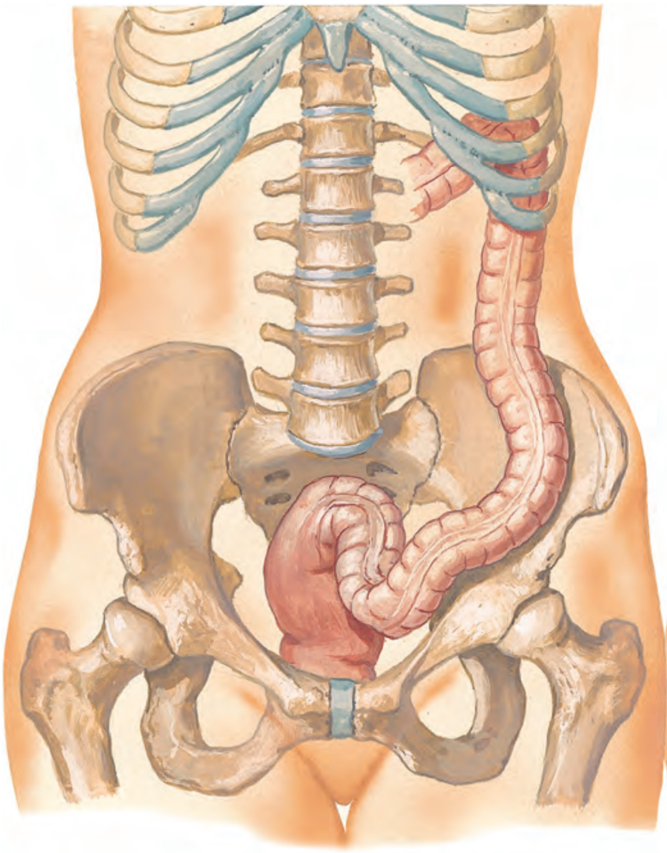
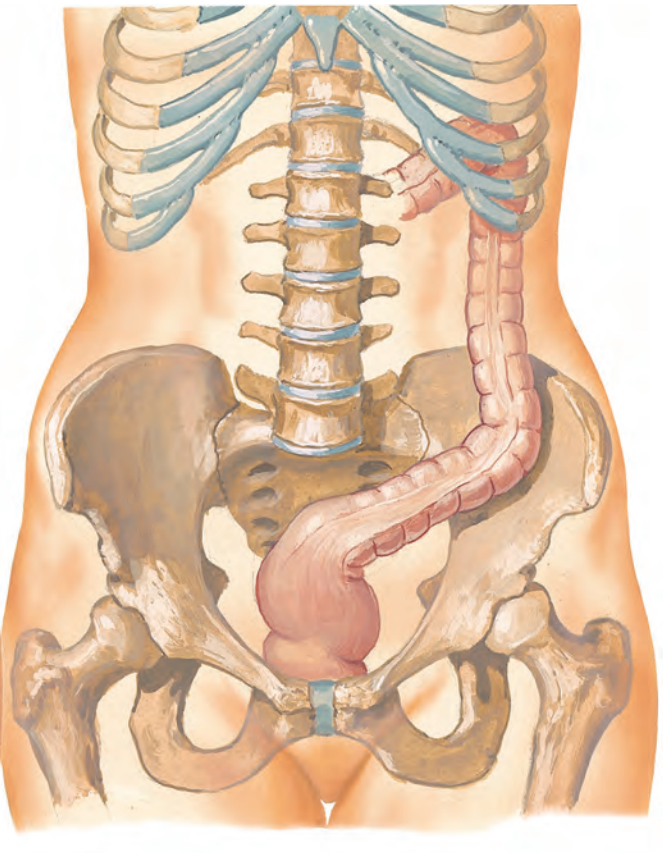
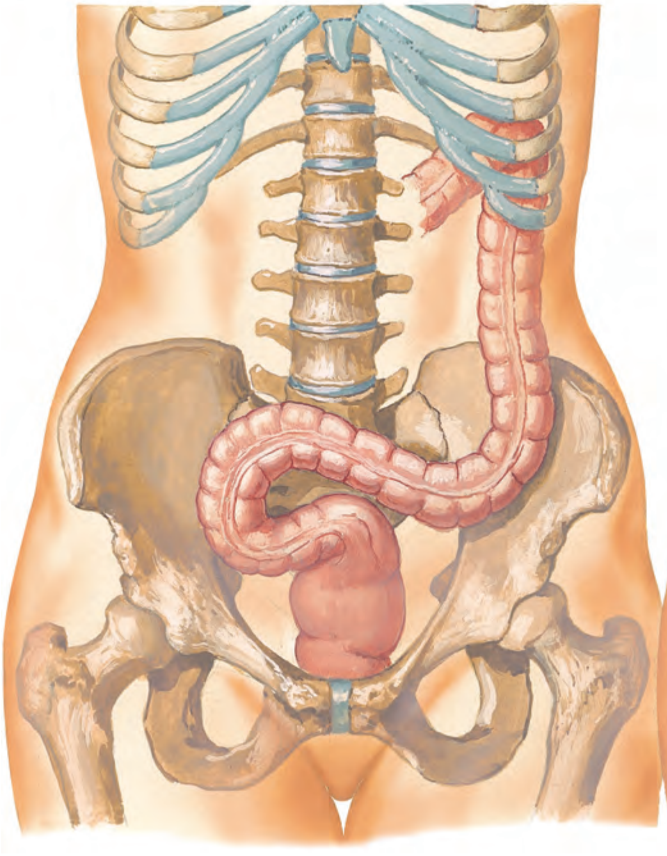
Sigmoid Colon: Variations in Position



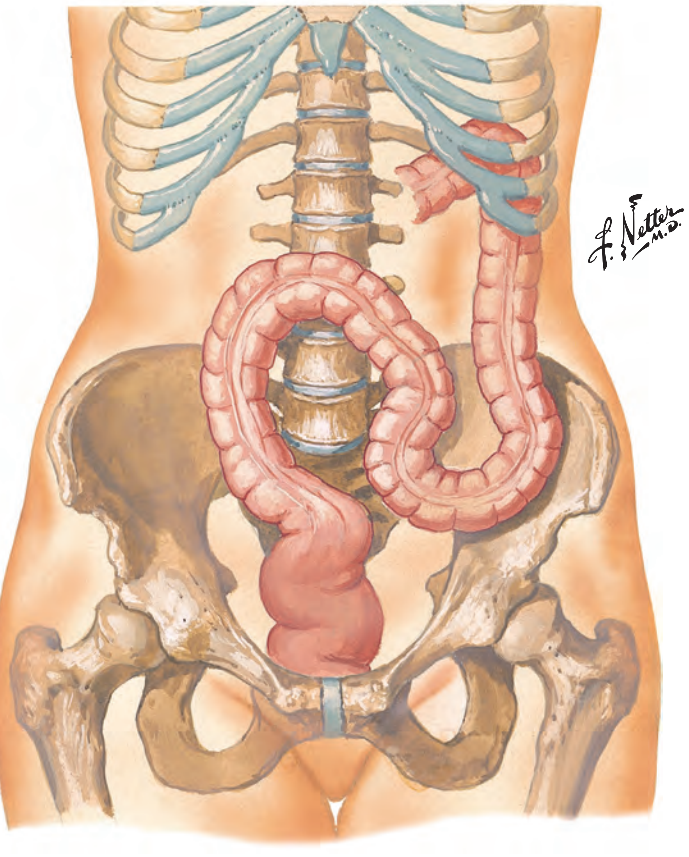
Typical



Short, straight, obliquely entering pelvis

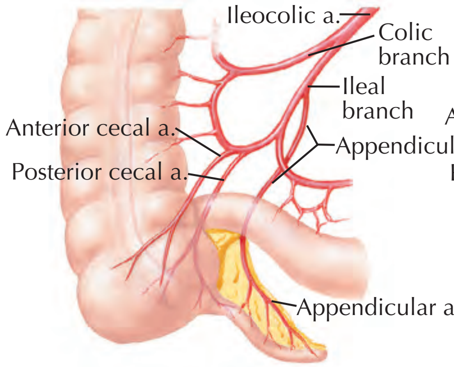


Looping to right side

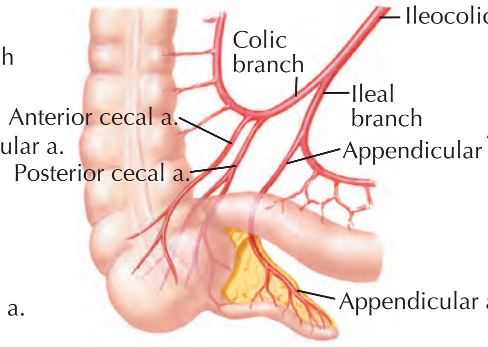


Ascending high into abdomen

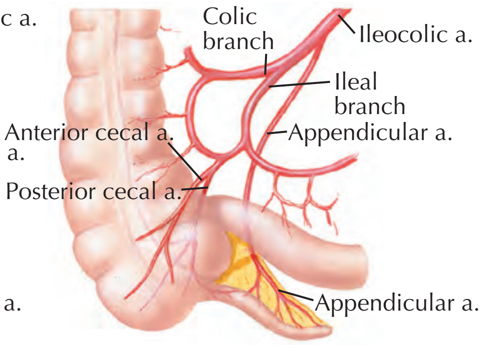
Variations in Arterial Supply to Cecum and Posterior Peritoneal Attachment of Cecum


Ileocolic a.
Colic branch
Ileal branch
Anterior cecal a.
Appendicular a.
Posterior cecal a.
Appendicular a.

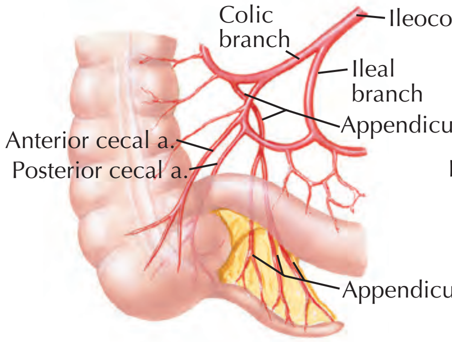
Anterior cecal and posterior cecal arteries originate from arcade between colic and ileal branches of ileocolic artery and appendicular artery from ileal branch


Ileocolic a.
Colic branch
Ileal branch
Anterior cecal a.
Appendicular a.
Posterior cecal a.
Appendicular a.

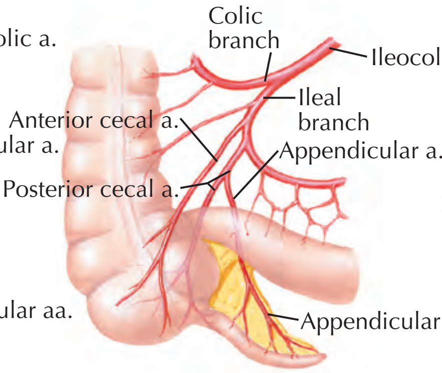
Anterior cecal and posterior cecal arteries originate from colic branch; appendicular artery from ileal branch of ileocolic artery


Colic branch
Ileocolic a.
Ileal branch
Anterior cecal a.
Appendicular a.
Posterior cecal a.
Appendicular a.

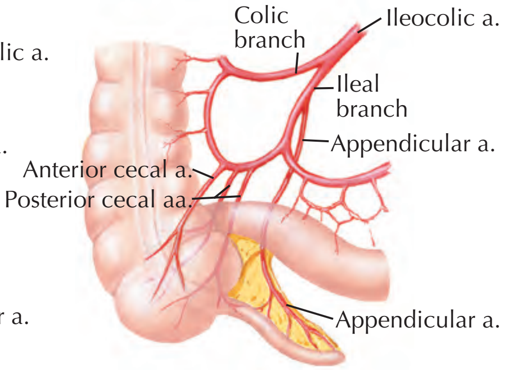
Anterior cecal and posterior cecal arteries have common origin from arcade; appendicular artery from ileocolic artery


Colic branch
Ileocolic a.
Ileal branch
Appendicular a.
Anterior cecal a.
Posterior cecal a.
Appendicular aa.

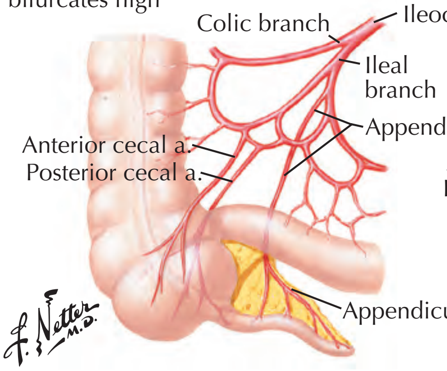
Anterior cecal and posterior cecal arteries originate from arcade between colic and ileal branches of ileocolic artery; appendicular artery from colic branch bifurcates high


Colic branch
Ileocolic a.
Ileal branch
Anterior cecal a.
Appendicular a.
Posterior cecal a.
Appendicular a.

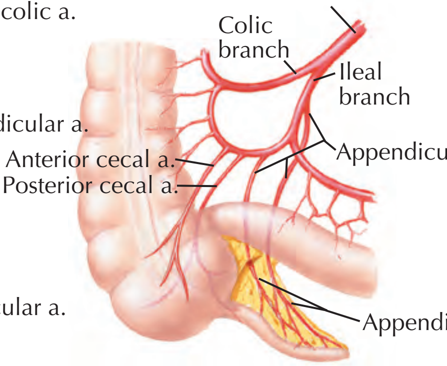
Anterior cecal and posterior cecal arteries originate from ileal branch of ileocolic artery; appendicular artery from posterior cecal artery


Colic branch
Ileocolic a.
Ileal branch
Appendicular a.
Anterior cecal a.
Posterior cecal aa.
Appendicular a.

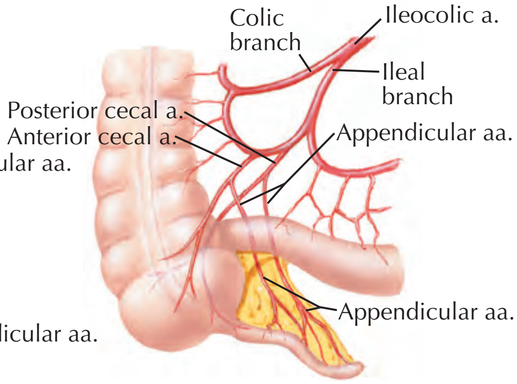
Anterior cecal and two posterior cecal arteries originate from arcade; appendicular artery from ileal branch of ileocolic artery


Colic branch
Ileocolic a.
Ileal branch
Appendicular a.
Anterior cecal a.
Posterior cecal a.
Appendicular a.

Multiple arcades between ileal branch and colic branch of ileocolic artery. Anterior cecal and posterior cecal arteries originate from these arcades; appendicular artery from ileal branch

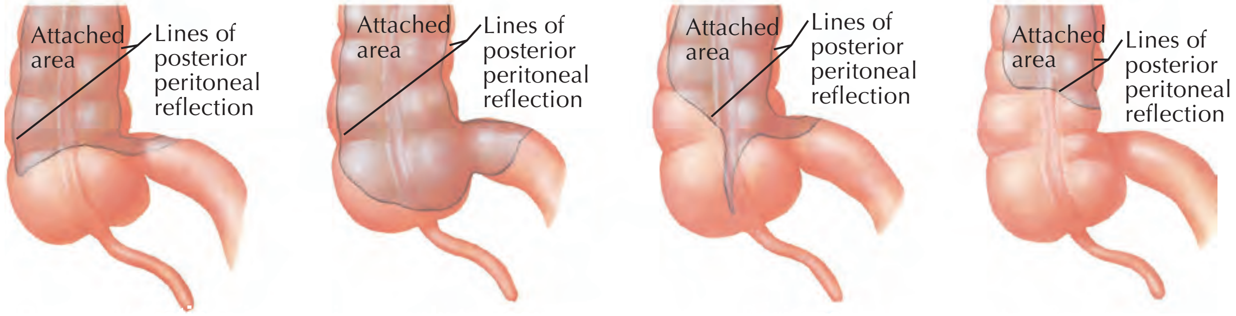

Ileocolic a.
Colic branch
Ileal branch
Appendicular aa.
Anterior cecal a.
Posterior cecal a.
Appendicular aa.

Anterior cecal and posterior cecal arteries originate from arcade between colic and ileal branches of ileocolic artery; two appendicular arteries, one deriving from arcade and the other from ileal branch, are present

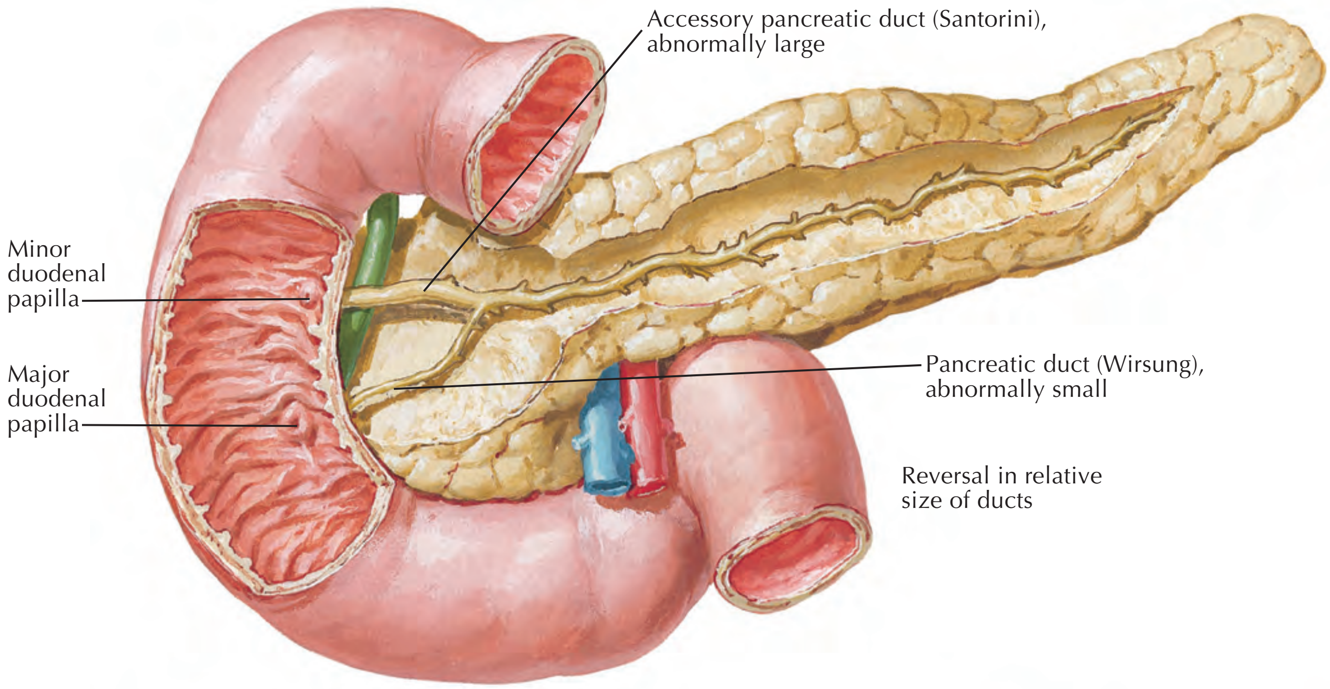

Colic branch
Ileocolic a.
Ileal branch
Posterior cecal a.
Anterior cecal a.
Appendicular aa.
Appendicular aa.

Anterior cecal and posterior cecal arteries originate from arcade; two appendicular arteries, one deriving from anterior cecal artery and the other from posterior cecal artery, are present

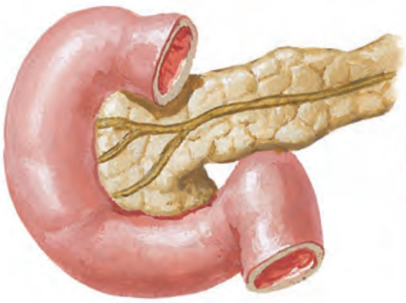
Some variations in posterior peritoneal attachment of cecum


Attached area
Lines of posterior peritoneal reflection
Attached area
Lines of posterior peritoneal reflection
Attached area
Lines of posterior peritoneal reflection
Attached area
Lines of posterior peritoneal reflection

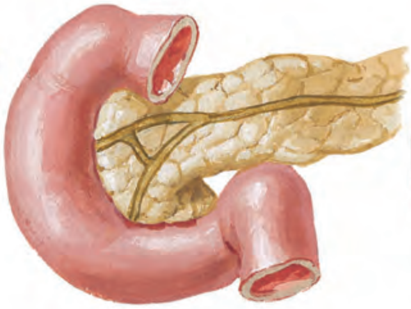
Variations in Pancreatic Duct


Accessory pancreatic duct (Santorini), abnormally large
Minor duodenal papilla
Major duodenal papilla
Pancreatic duct (Wirsung), abnormally small

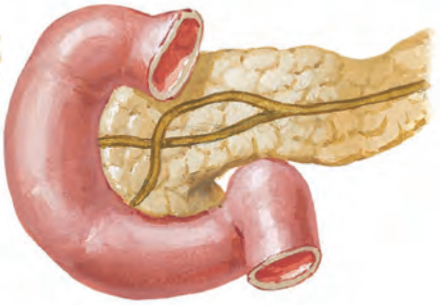
Reversal in relative size of ducts



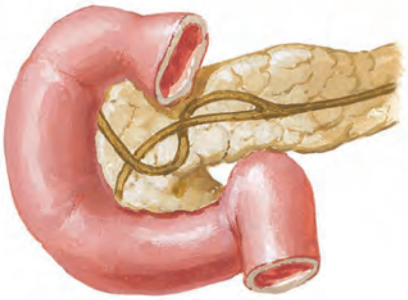
Two accessory pancreatic ducts



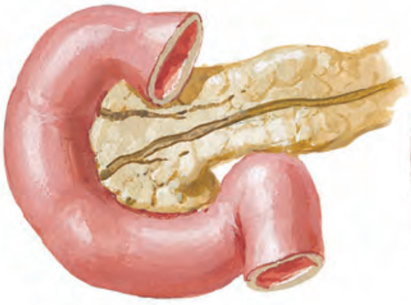
Anastomosis between ducts



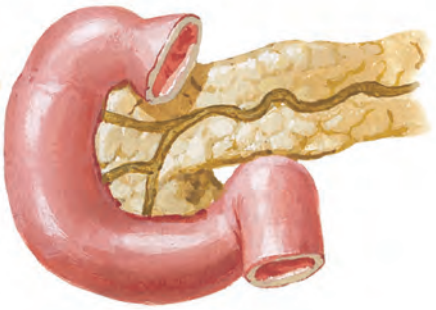
Crossing of ducts



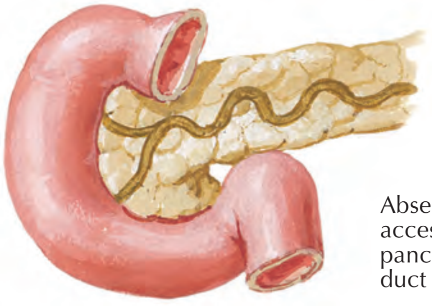
Double crossing of ducts



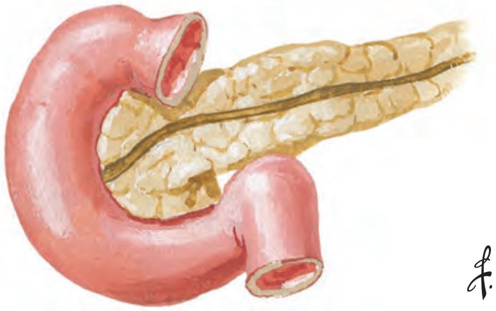
No communication between ducts



Two pancreatic ducts



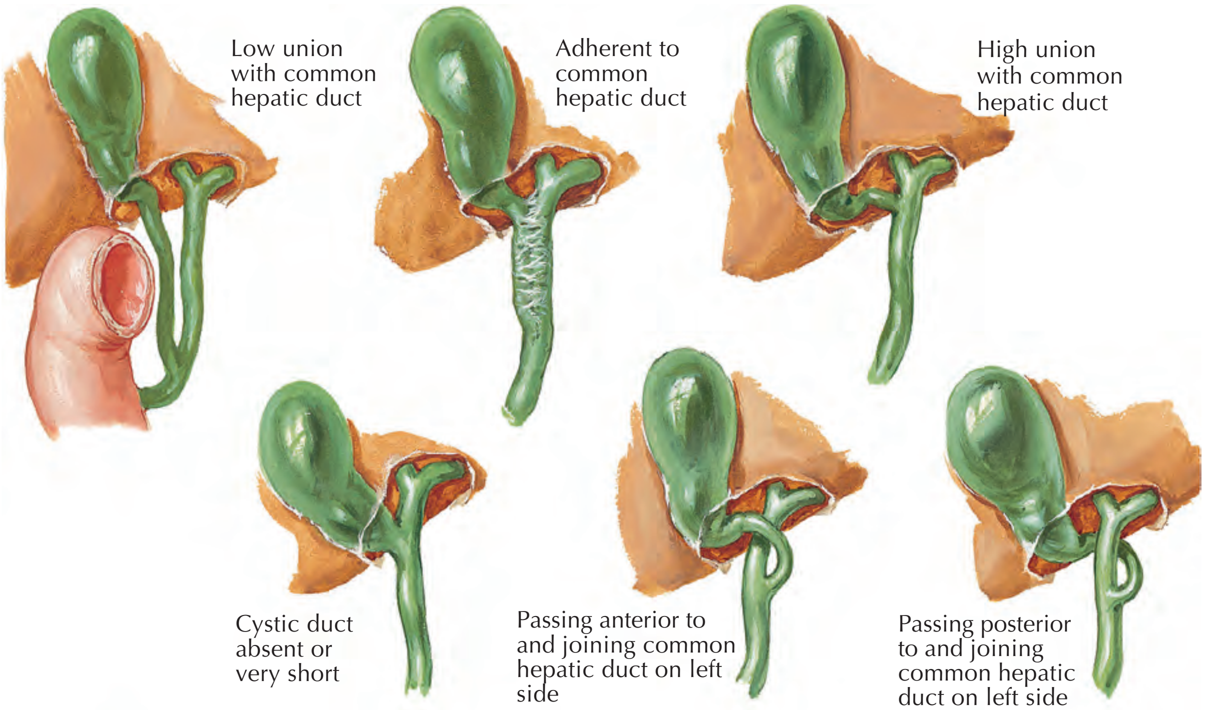
Tortuosity of ducts



Absence of accessory pancreatic duct

Variations in Cystic, Hepatic, and Pancreatic Ducts

Variations in cystic duct


Low union with common hepatic duct

Adherent to common hepatic duct

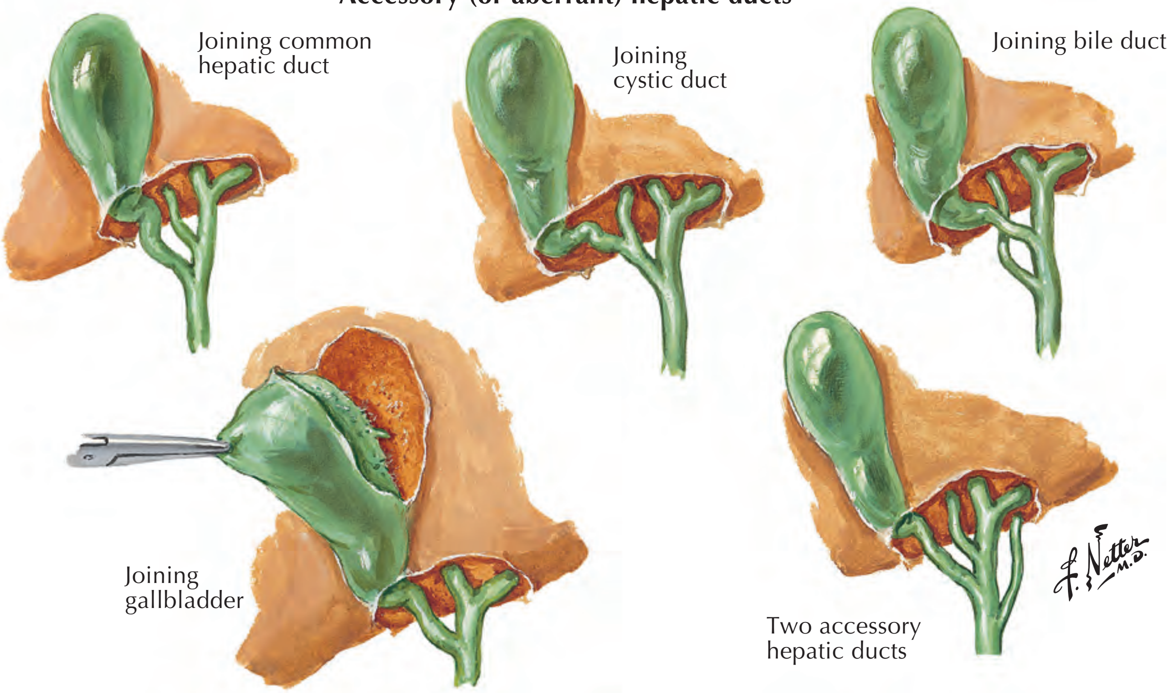
High union with common hepatic duct

Cystic duct absent or very short

Passing anterior to and joining common hepatic duct on left side

Passing posterior to and joining common hepatic duct on left side

Accessory (or aberrant) hepatic ducts


Joining common hepatic duct

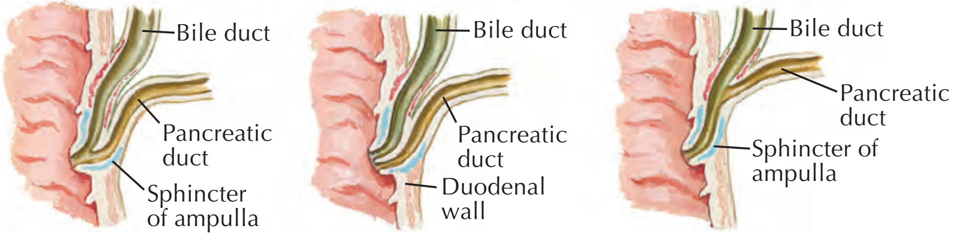
Joining cystic duct

Joining bile duct

Joining gallbladder

Two accessory hepatic ducts

Variations in union of bile and pancreatic ducts

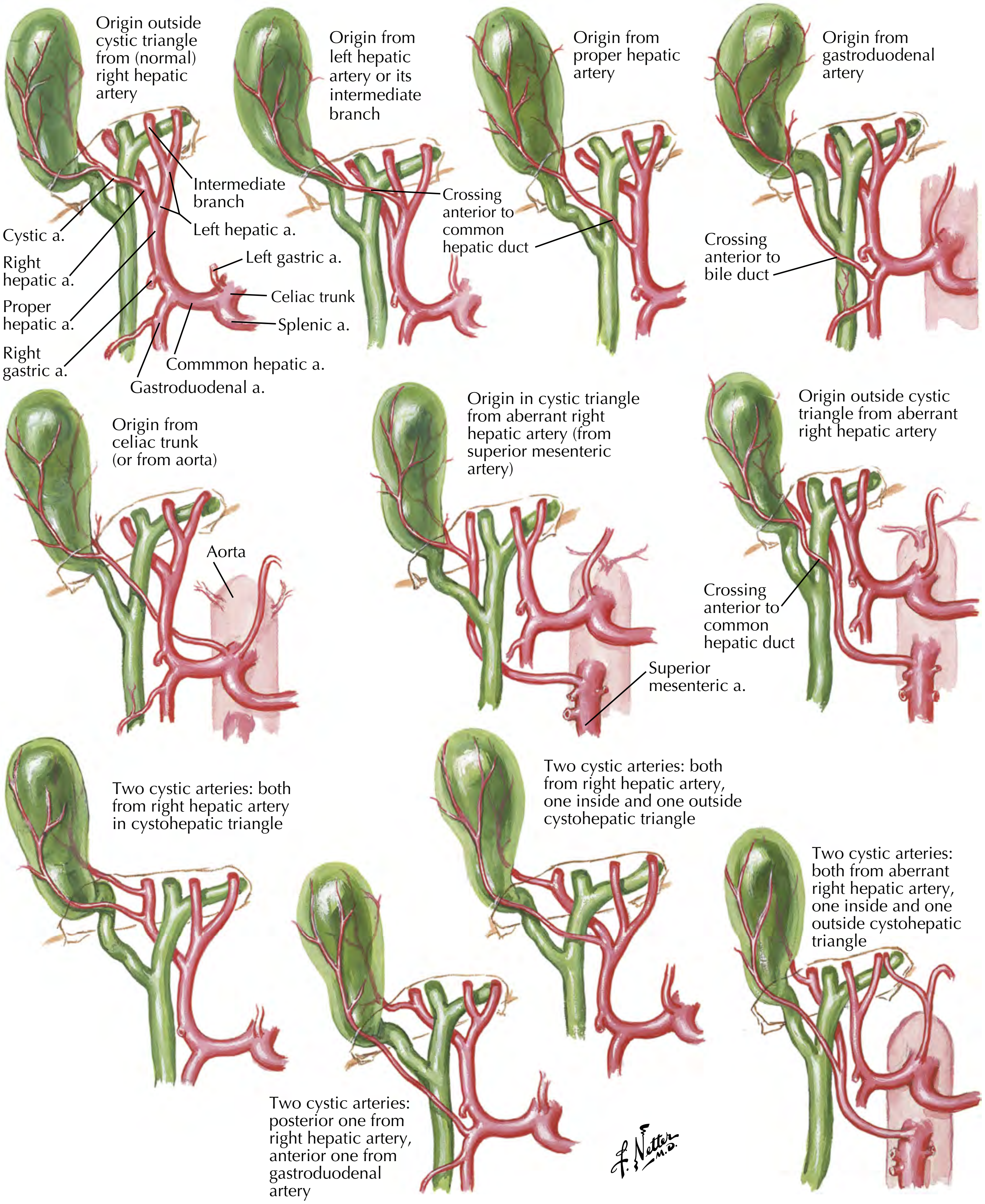

Bile duct
Pancreatic duct
Sphincter of ampulla
Bile duct
Pancreatic duct
Duodenal wall
Bile duct
Pancreatic duct
Sphincter of ampulla

Short common channel

No common channel

Long common channel

Variations in Cystic Arteries


Origin outside cystic triangle from (normal) right hepatic artery

Origin from left hepatic artery or its intermediate branch

Origin from proper hepatic artery

Origin from gastroduodenal artery

Origin from celiac trunk (or from aorta)

Origin in cystic triangle from aberrant right hepatic artery (from superior mesenteric artery)

Origin outside cystic triangle from aberrant right hepatic artery

Two cystic arteries: both from right hepatic artery in cystohepatic triangle

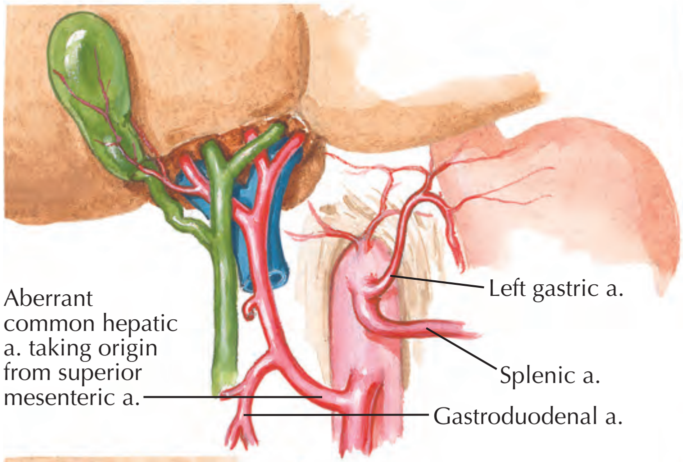
Two cystic arteries: both from right hepatic artery, one inside and one outside cystohepatic triangle

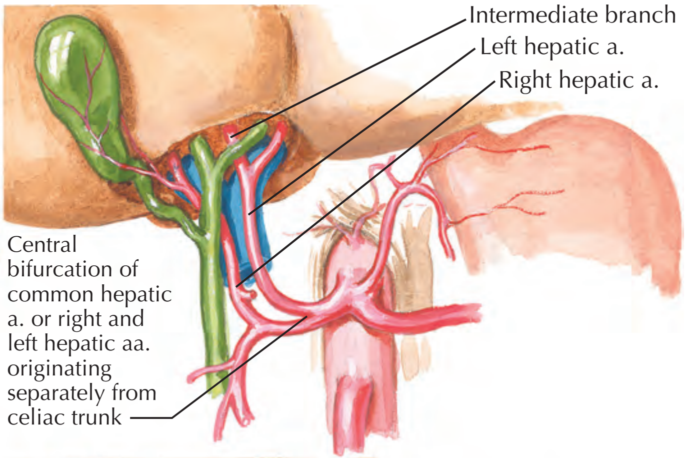
Two cystic arteries: both from aberrant right hepatic artery, one inside and one outside cystohepatic triangle

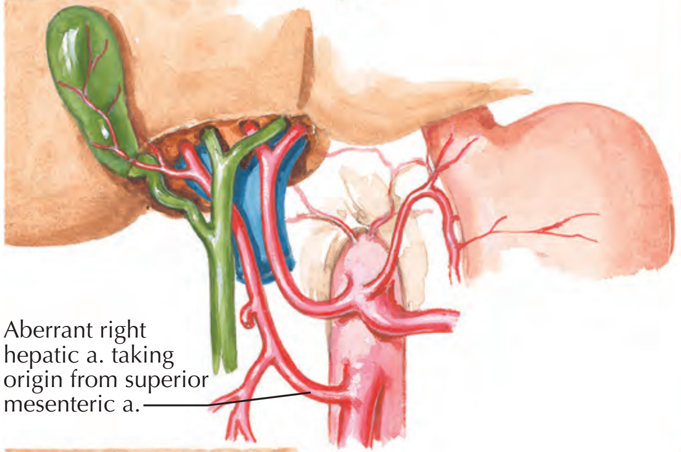
Two cystic arteries: posterior one from right hepatic artery, anterior one from gastroduodenal artery

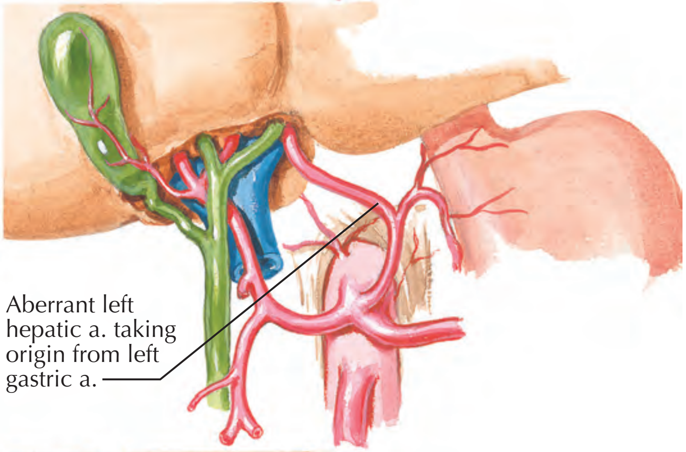
Intermediate branch
Left hepatic a.
Cystic a.
Right hepatic a.
Proper hepatic a.
Right gastric a.
Left gastric a.
Celiac trunk
Splenic a.
Commmon hepatic a.
Gastroduodenal a.
Crossing anterior to common hepatic duct
Crossing anterior to bile duct
Aorta
Crossing anterior to common hepatic duct
Superior mesenteric a.

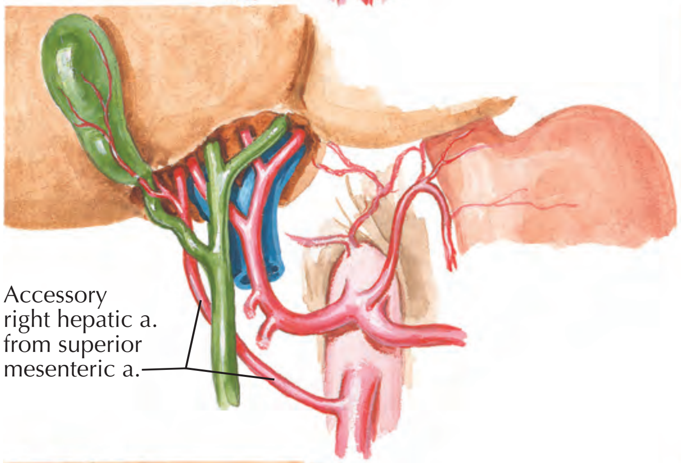
Variations in Hepatic Arteries

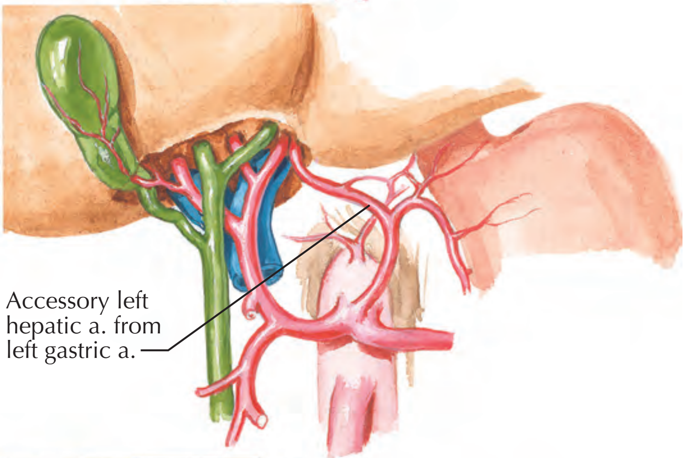

Aberrant common hepatic a. taking origin from superior mesenteric a.
Left gastric a.
Splenic a.
Gastroduodenal a.

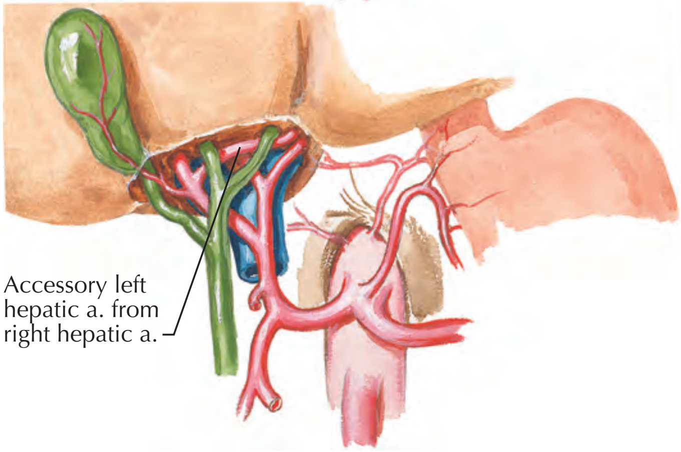

Intermediate branch
Left hepatic a.
Right hepatic a.
Central bifurcation of common hepatic a. or right and left hepatic aa. originating separately from celiac trunk

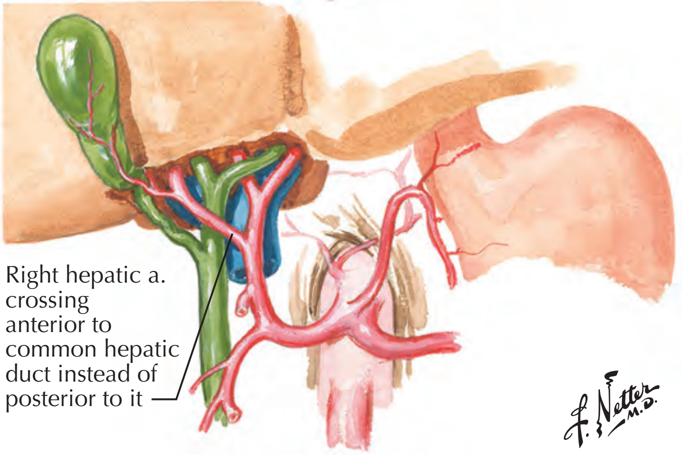

Aberrant right hepatic a. taking origin from superior mesenteric a.


Aberrant left hepatic a. taking origin from left gastric a.


Accessory right hepatic a. from superior mesenteric a.

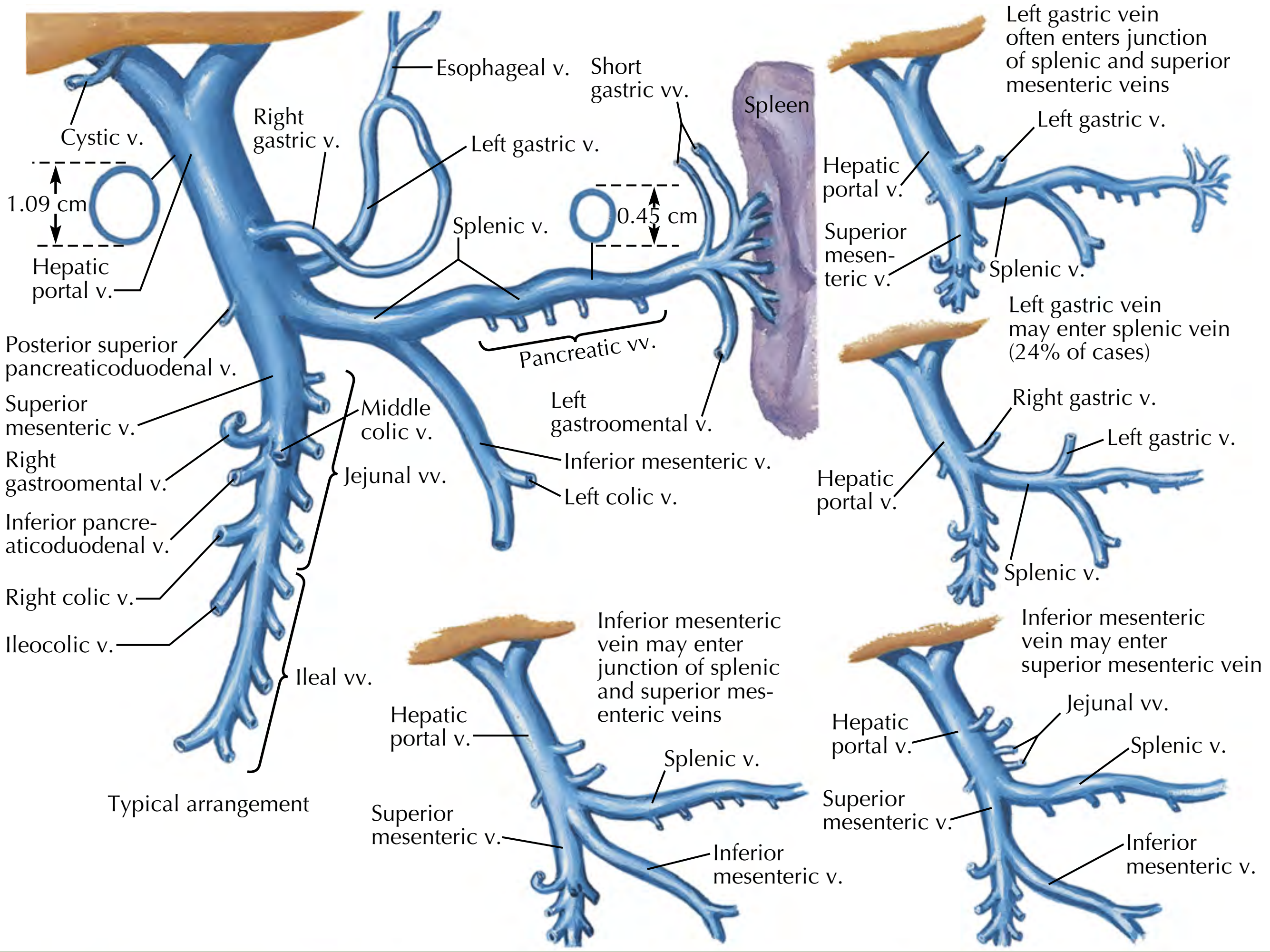

Accessory left hepatic a. from left gastric a.


Accessory left hepatic a. from right hepatic a.


Right hepatic a. crossing anterior to common hepatic duct instead of posterior to it
F. Netter M.D.

Variations and Anomalies of Hepatic Portal Vein

Variations



Esophageal v.
Short gastric vv.
Spleen
Cystic v.
Right gastric v.
Left gastric v.
1.09 cm
Hepatic portal v.
Splenic v.
0.45 cm
Posterior superior pancreaticoduodenal v.
Pancreatic vv.
Superior mesenteric v.
Middle colic v.
Left gastroomental v.
Right gastroomental v.
Inferior mesenteric v.
Jejunal vv.
Left colic v.
Inferior pancreaticoduodenal v.
Right colic v.
Ileocolic v.
Ileal vv.
Left gastric v.
Hepatic portal v.
Superior mesenteric v.
Splenic v.
Right gastric v.
Left gastric v.
Hepatic portal v.
Splenic v.
Hepatic portal v.
Splenic v.
Superior mesenteric v.
Inferior mesenteric v.
Jejunal vv.
Hepatic portal v.
Splenic v.
Superior mesenteric v.
Inferior mesenteric v.

Typical arrangement

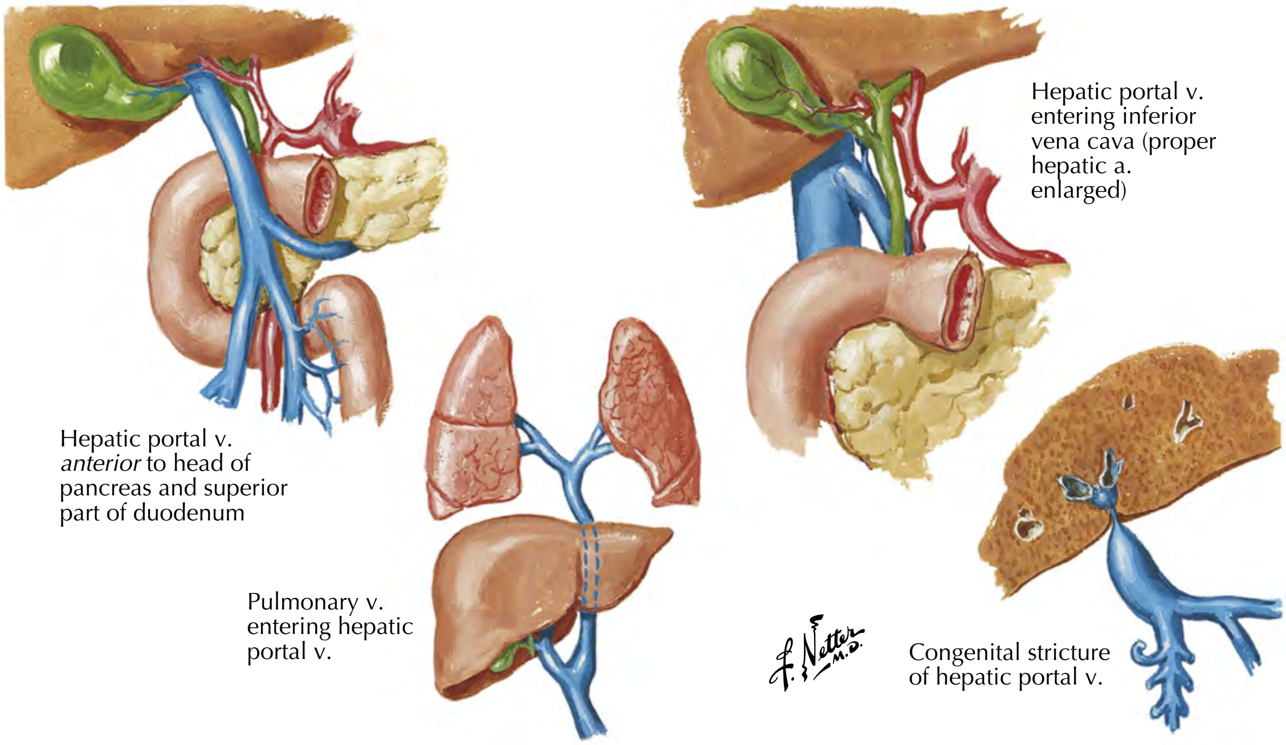
Left gastric vein often enters junction of splenic and superior mesenteric veins

Left gastric vein may enter splenic vein (24% of cases)

Inferior mesenteric vein may enter junction of splenic and superior mesenteric veins

Inferior mesenteric vein may enter superior mesenteric vein

Anomalies

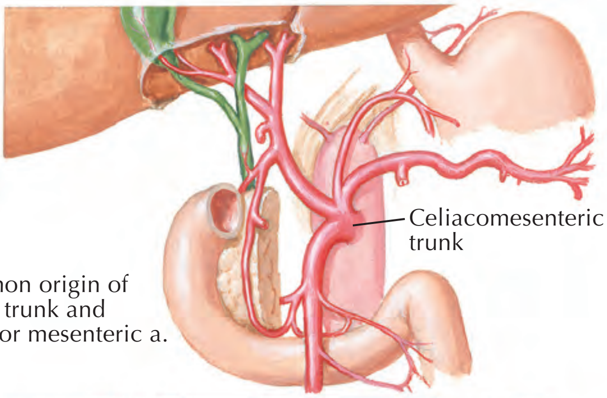


Hepatic portal v. *anterior* to head of pancreas and superior part of duodenum

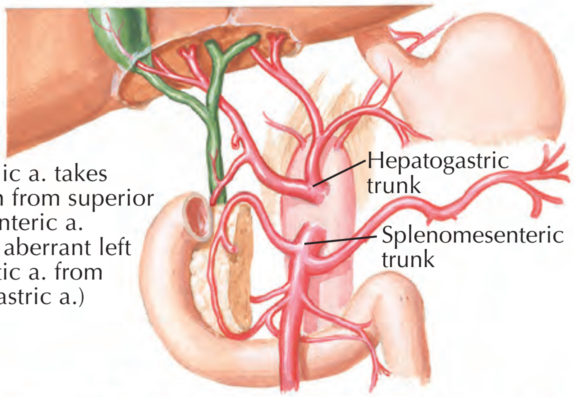
Pulmonary v. entering hepatic portal v.

Hepatic portal v. entering inferior vena cava (proper hepatic a. enlarged)

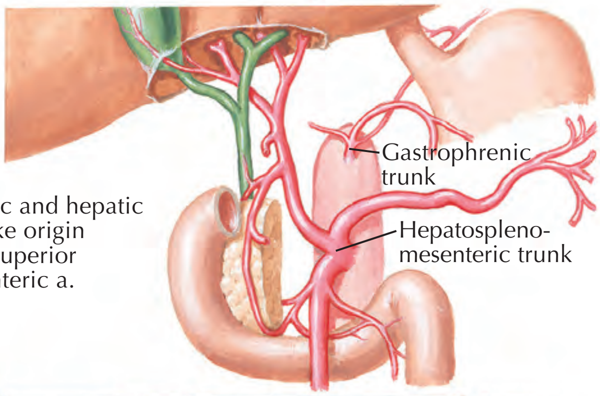
Congenital stricture of hepatic portal v.


Celiacomesenteric trunk

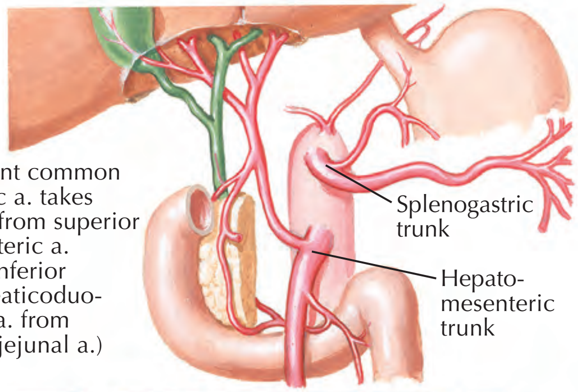
Common origin of celiac trunk and superior mesenteric a.


Hepatogastric trunk
Splenomesenteric trunk

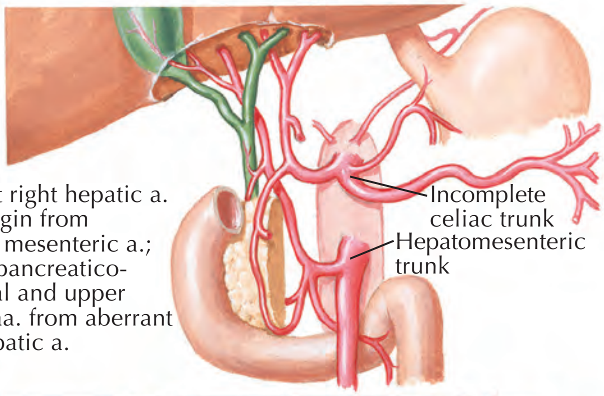
Splenic a. takes origin from superior mesenteric a. (note aberrant left hepatic a. from left gastric a.)


Gastrophrenic trunk
Hepatospleno-mesenteric trunk

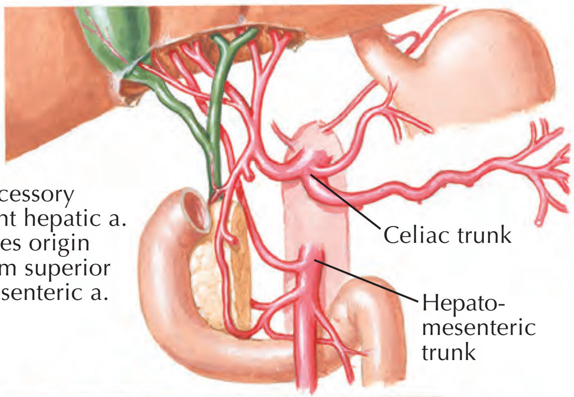
Splenic and hepatic aa. take origin from superior mesenteric a.


Splenogastric trunk
Hepato-mesenteric trunk

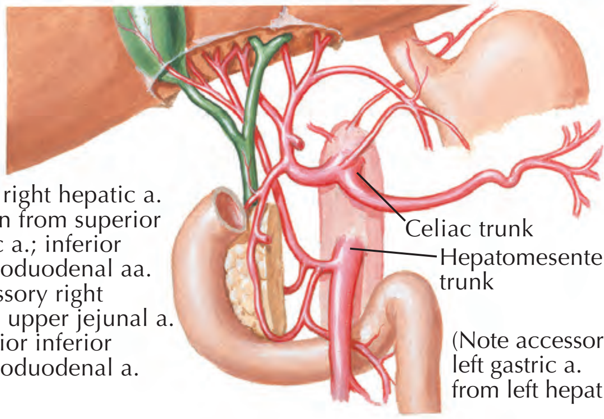
Aberrant common hepatic a. takes origin from superior mesenteric a. (note inferior pancreaticoduodenal a. from upper jejunal a.)


Incomplete celiac trunk
Hepatomesenteric trunk

Aberrant right hepatic a. takes origin from superior mesenteric a.; inferior pancreatico-duodenal and upper jejunal aa. from aberrant right hepatic a.

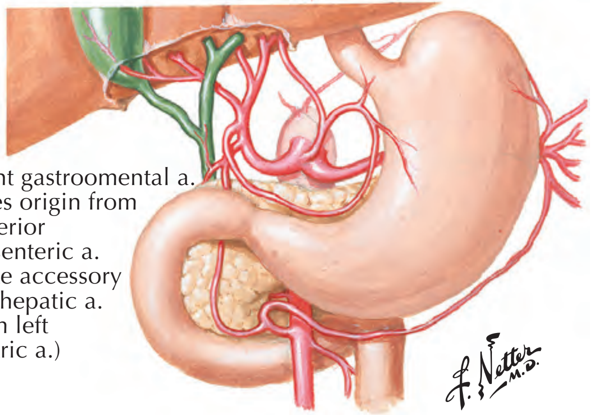

Celiac trunk
Hepato-mesenteric trunk

Accessory right hepatic a. takes origin from superior mesenteric a.


Celiac trunk
Hepatomesenteric trunk

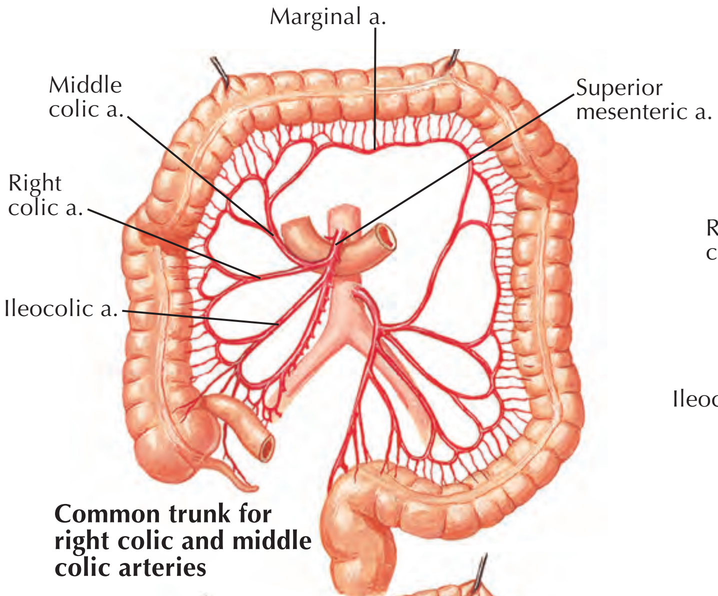
Accessory right hepatic a. takes origin from superior mesenteric a.; inferior pancreaticoduodenal aa. from accessory right hepatic a.; upper jejunal a. from anterior inferior pancreaticoduodenal a.

(Note accessory left gastric a. from left hepatic a.)

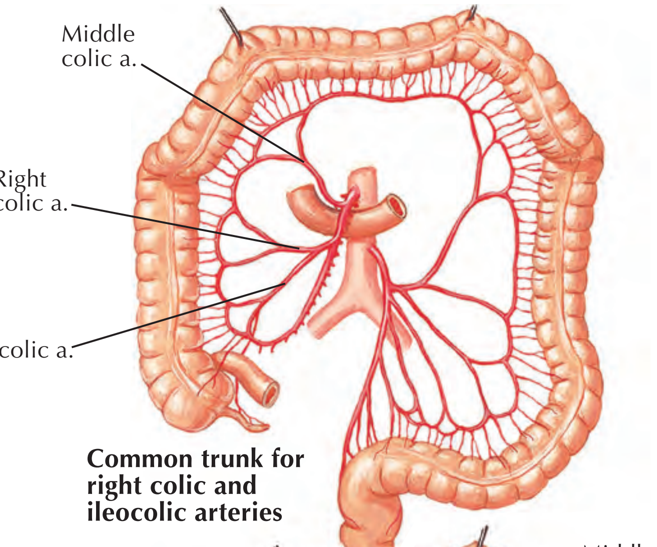


Right gastroomental a. takes origin from superior mesenteric a. (note accessory left hepatic a. from left gastric a.)

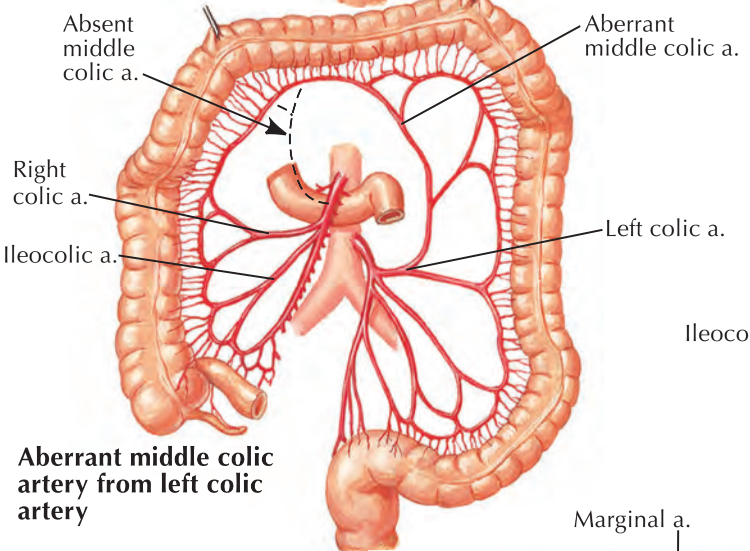
Variations in Colic Arteries


Marginal a.
Middle colic a.
Superior mesenteric a.
Right colic a.
Ileocolic a.

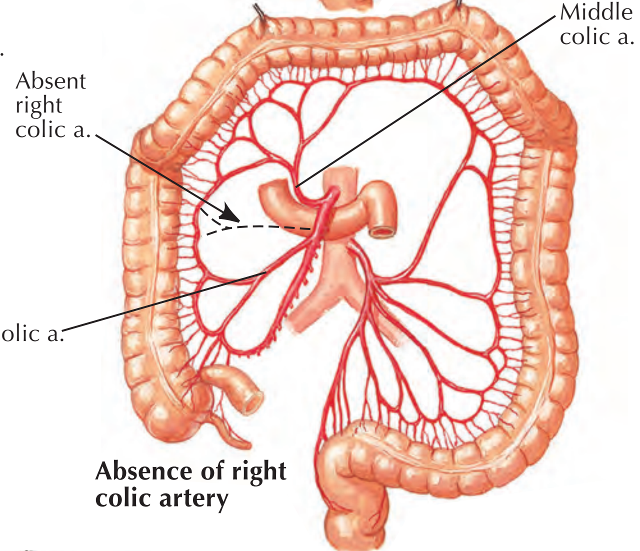
Common trunk for right colic and middle colic arteries


Middle colic a.
Right colic a.
Ileocolic a.

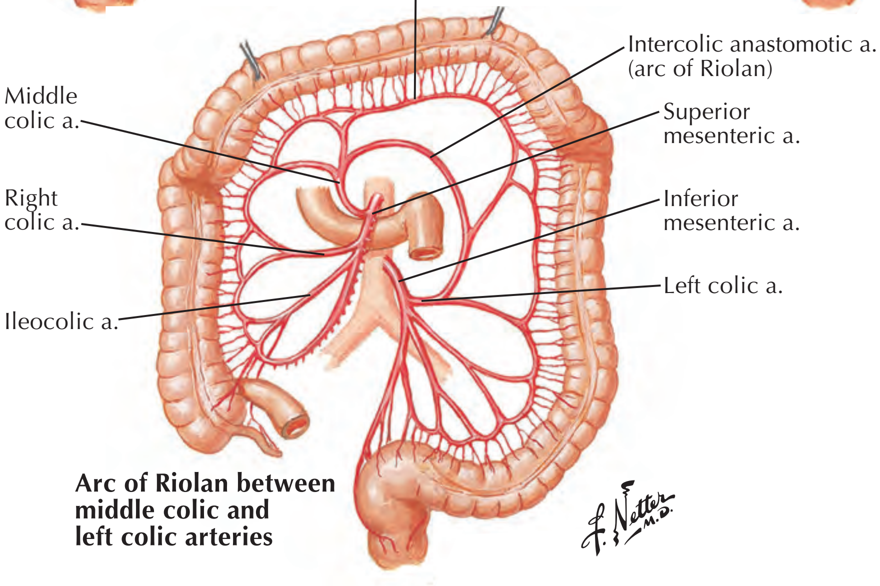
Common trunk for right colic and ileocolic arteries


Absent middle colic a.
Aberrant middle colic a.
Right colic a.
Ileocolic a.
Left colic a.

Aberrant middle colic artery from left colic artery

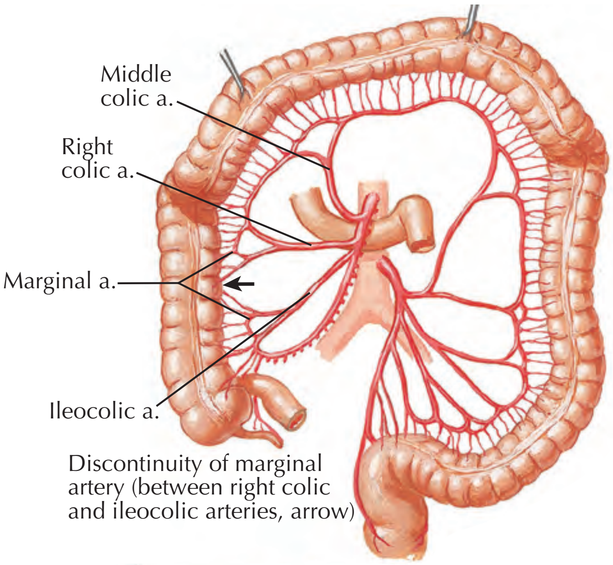

Middle colic a.
Absent right colic a.
Ileocolic a.

Absence of right colic artery

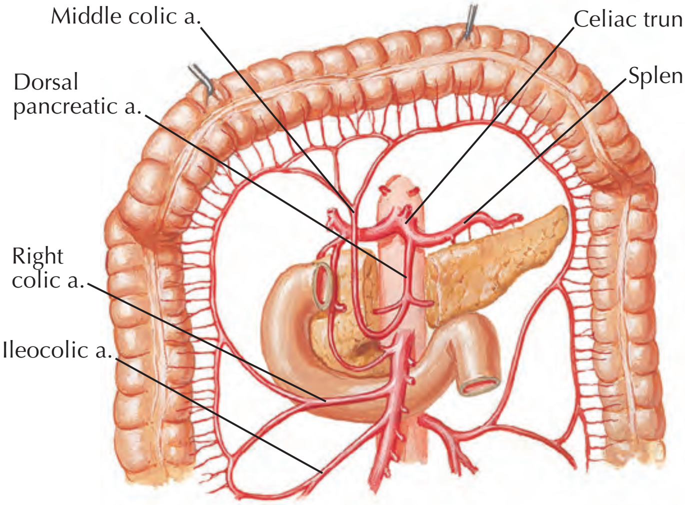

Marginal a.
Intercolic anastomotic a. (arc of Riolan)
Middle colic a.
Superior mesenteric a.
Right colic a.
Inferior mesenteric a.
Left colic a.
Ileocolic a.

Arc of Riolan between middle colic and left colic arteries

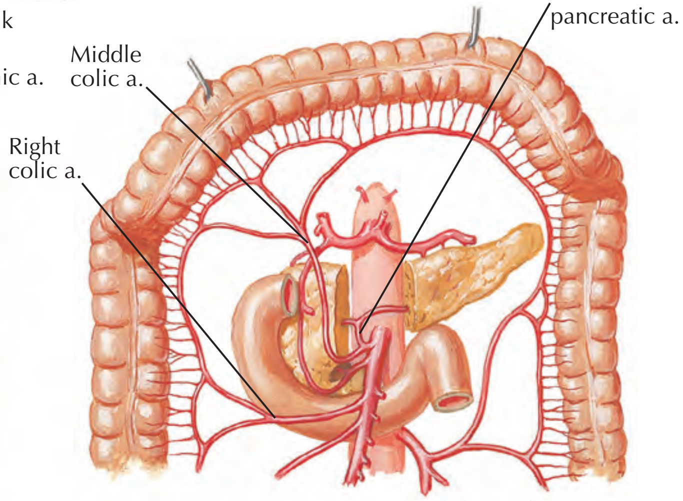
F. Netter M.D.


Middle colic a.
Right colic a.
Marginal a.
Ileocolic a.

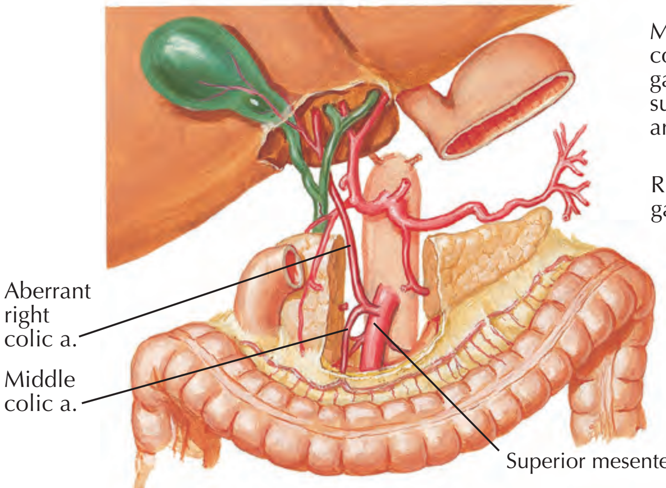
Discontinuity of marginal artery (between right colic and ileocolic arteries, arrow)


Middle colic a.
Celiac trunk
Dorsal pancreatic a.
Splenic a.
Right colic a.
Ileocolic a.

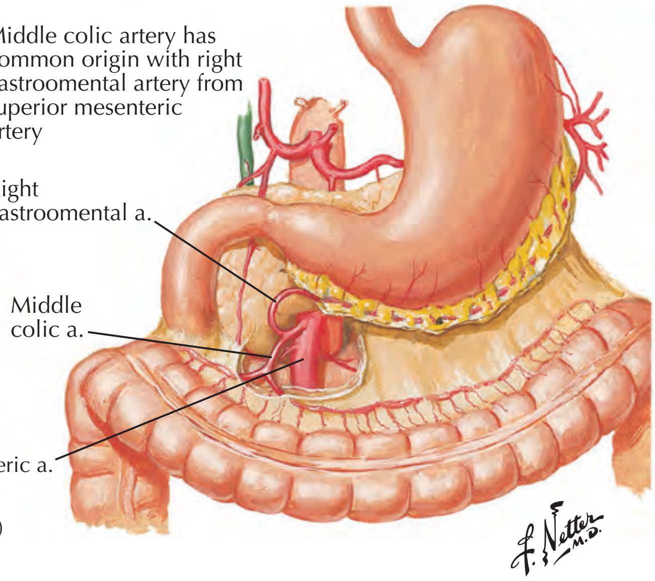
Middle colic artery originates from celiac trunk via dorsal pancreatic artery


Dorsal pancreatic a.
Middle colic a.
Right colic a.

Dorsal pancreatic artery originates from middle colic artery

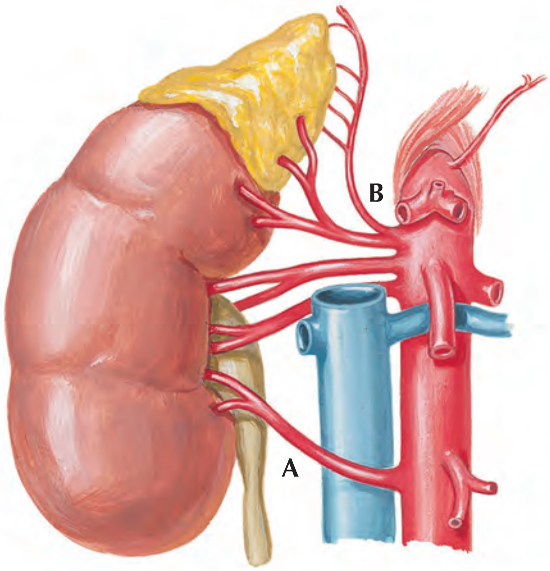

Aberrant right colic a.
Middle colic a.
Superior mesenteric a.

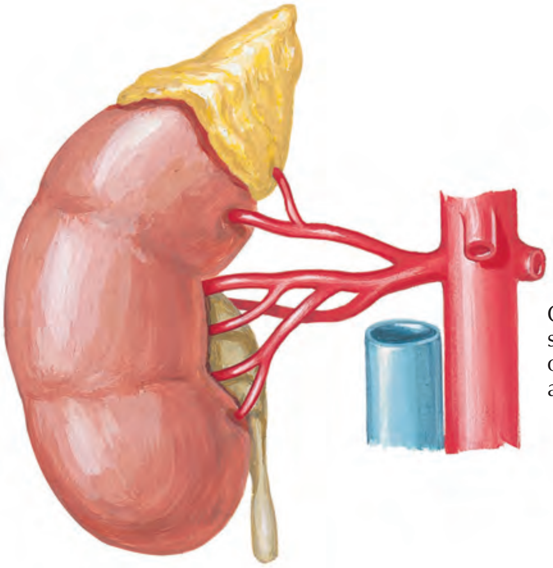
Middle colic artery originates from aberrant right hepatic artery (from superior mesenteric artery)


Middle colic artery has common origin with right gastroomental artery from superior mesenteric artery

Right gastroomental a.
Middle colic a.
F. Netter M.D.

Variations in Renal Artery and Vein

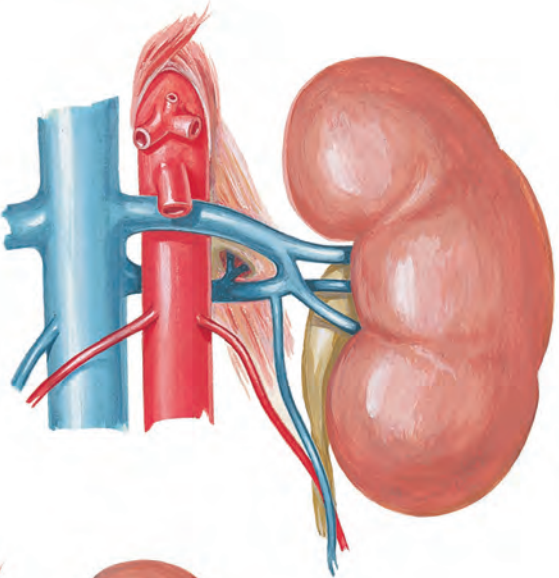




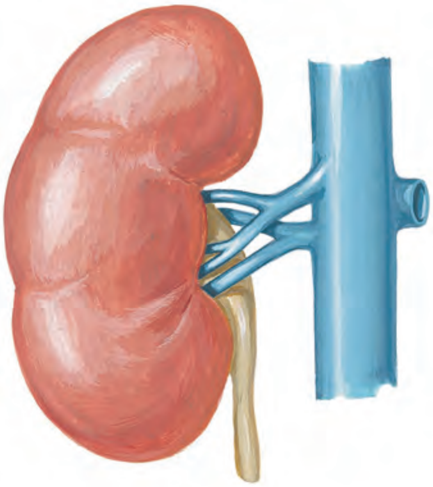
Central
subdivision
of renal
artery

A Low accessory right renal artery may pass anterior to inferior vena cava instead of posterior to it

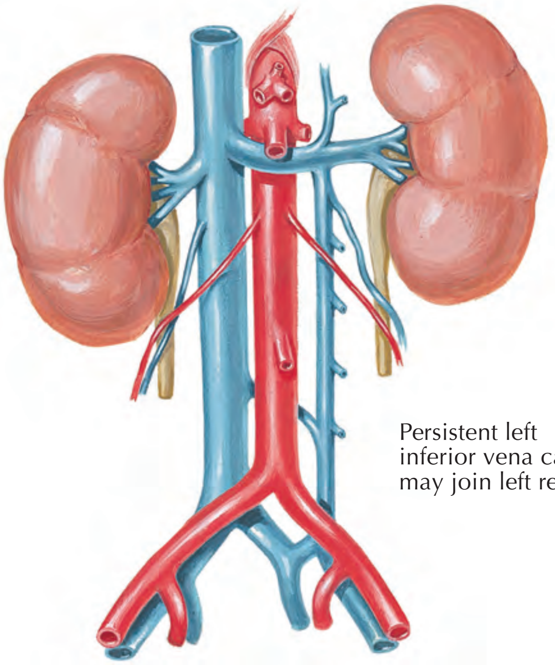
B Inferior phrenic artery and all suprarenal arteries may arise from an accessory renal artery



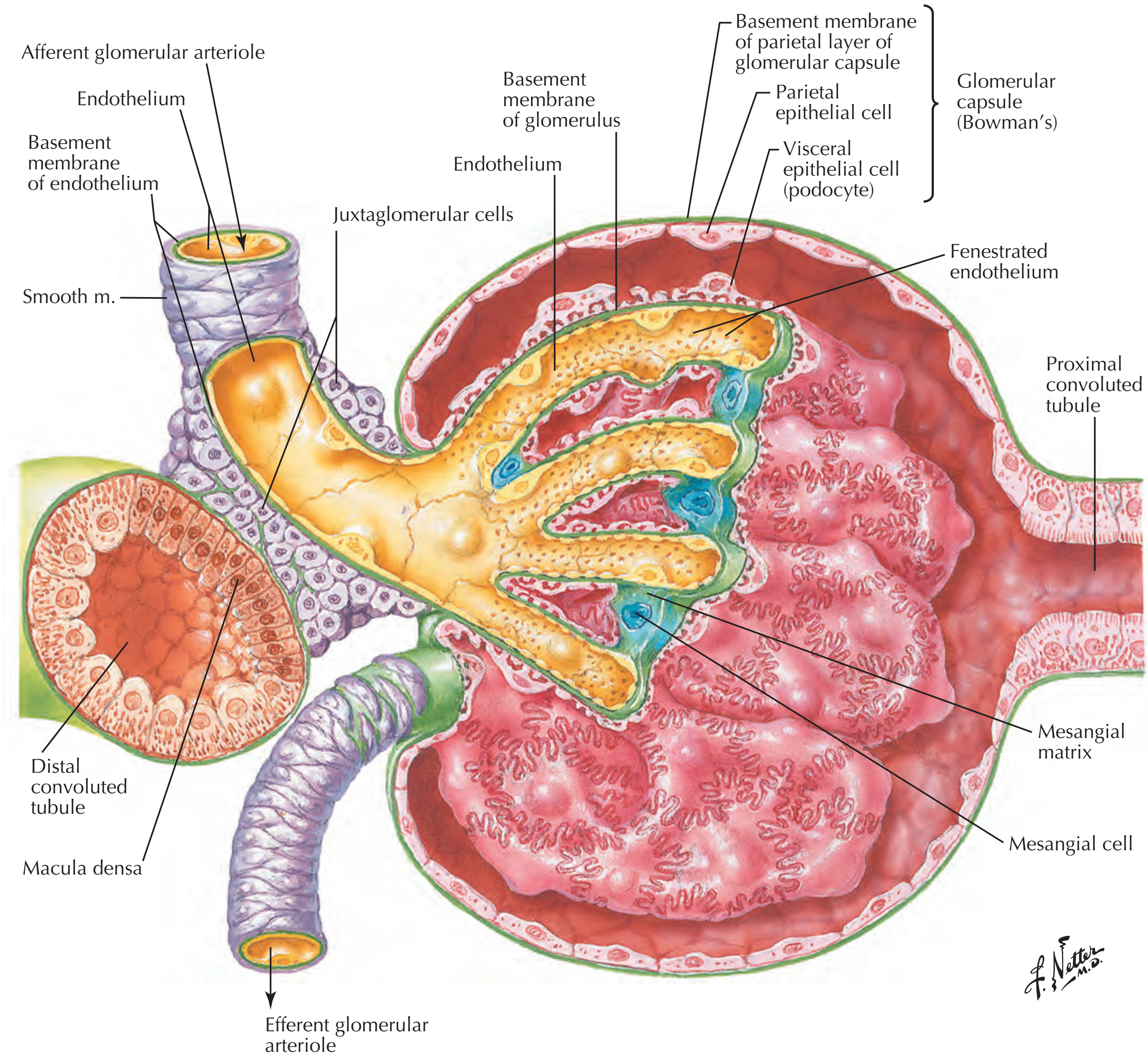
Two left renal
veins may form
ring around
abdominal aorta



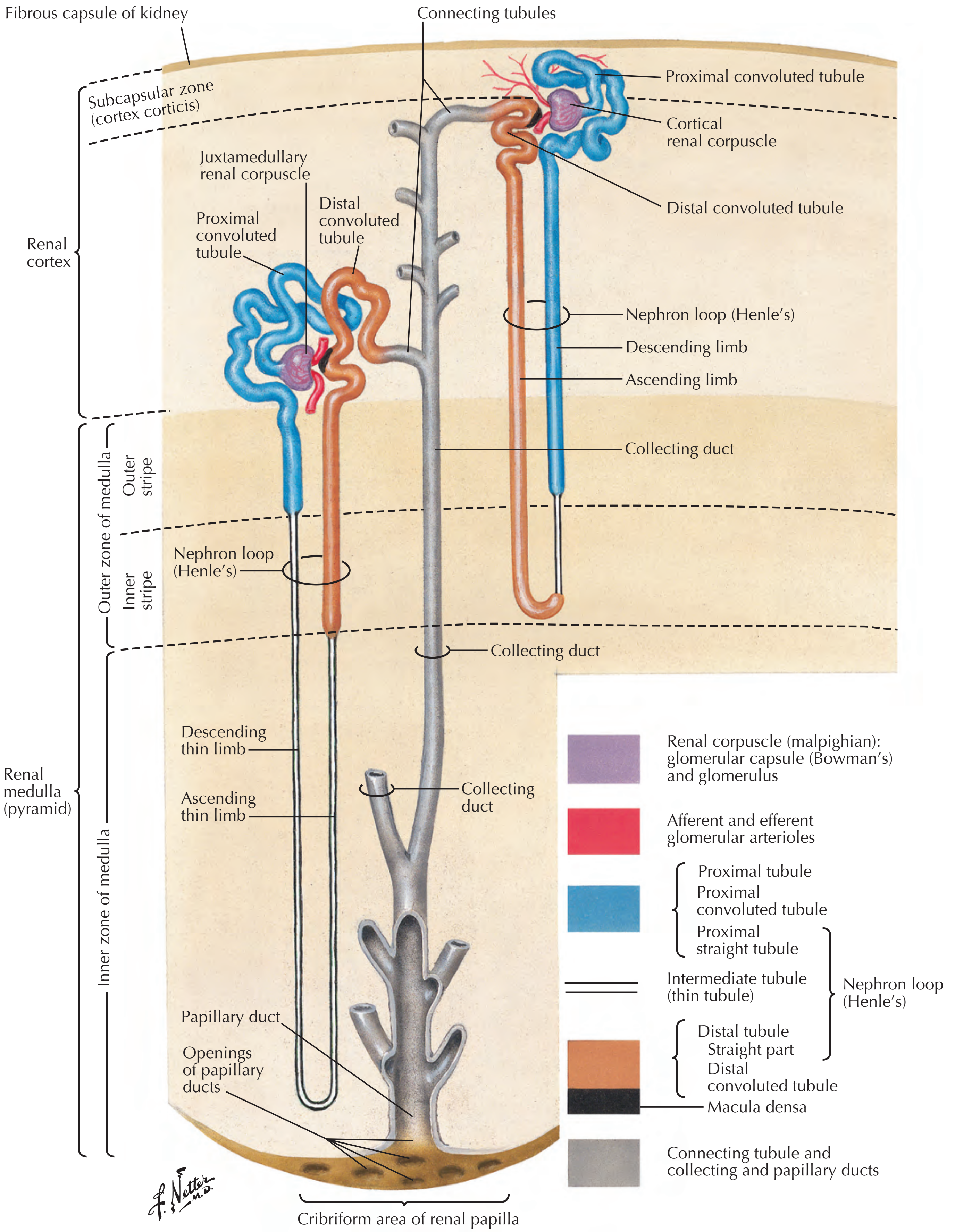
Multiple renal veins



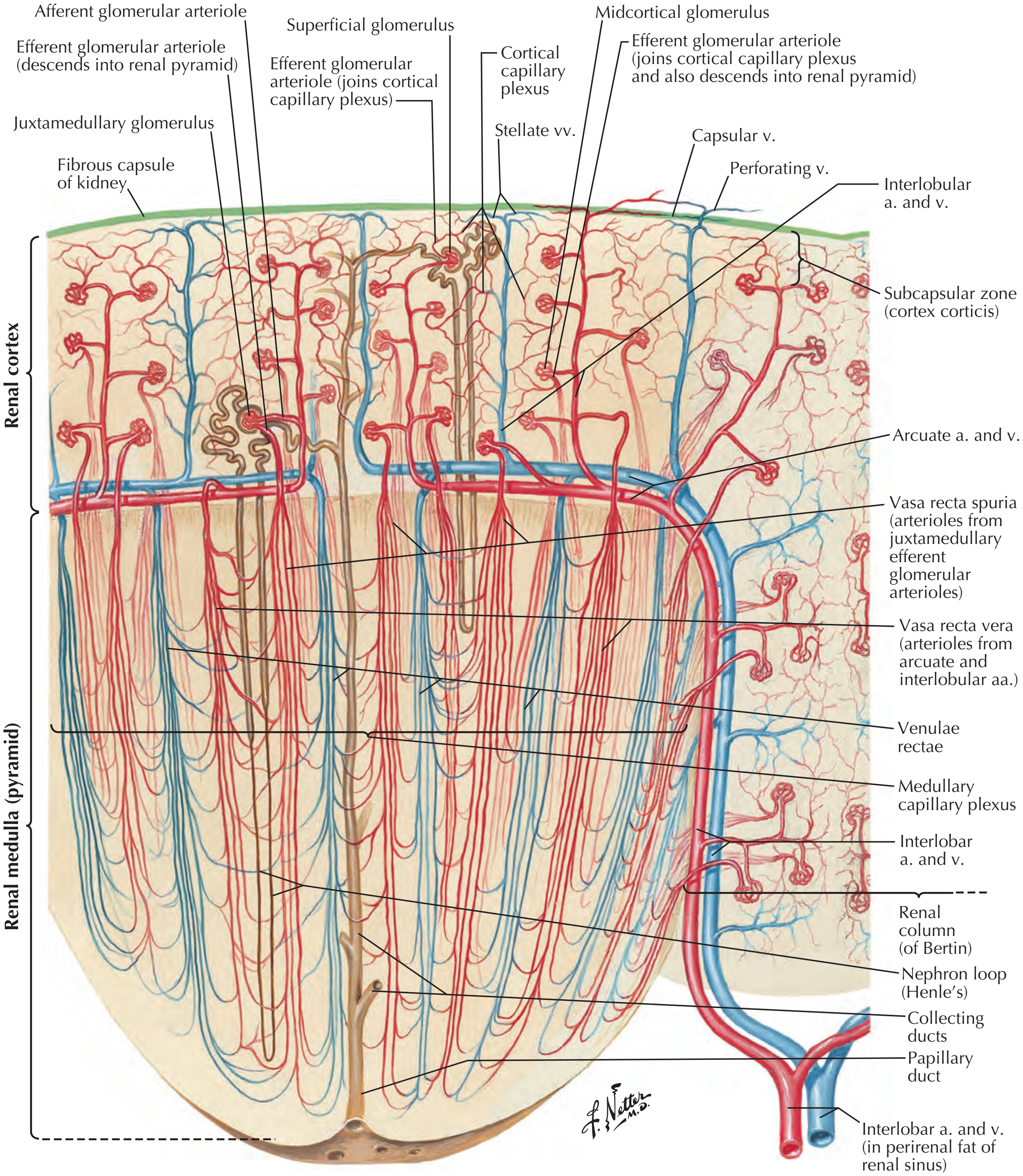
Persistent left
inferior vena cava
may join left renal vein


Afferent glomerular arteriole
Endothelium
Basement membrane of endothelium
Smooth m.
Juxtaglomerular cells
Endothelium
Basement membrane of glomerulus
Basement membrane of parietal layer of glomerular capsule
Parietal epithelial cell
Visceral epithelial cell (podocyte)
Glomerular capsule (Bowman's)
Fenestrated endothelium
Proximal convoluted tubule
Mesangial matrix
Mesangial cell
Distal convoluted tubule
Macula densa
Efferent glomerular arteriole
F. Netter M.D.

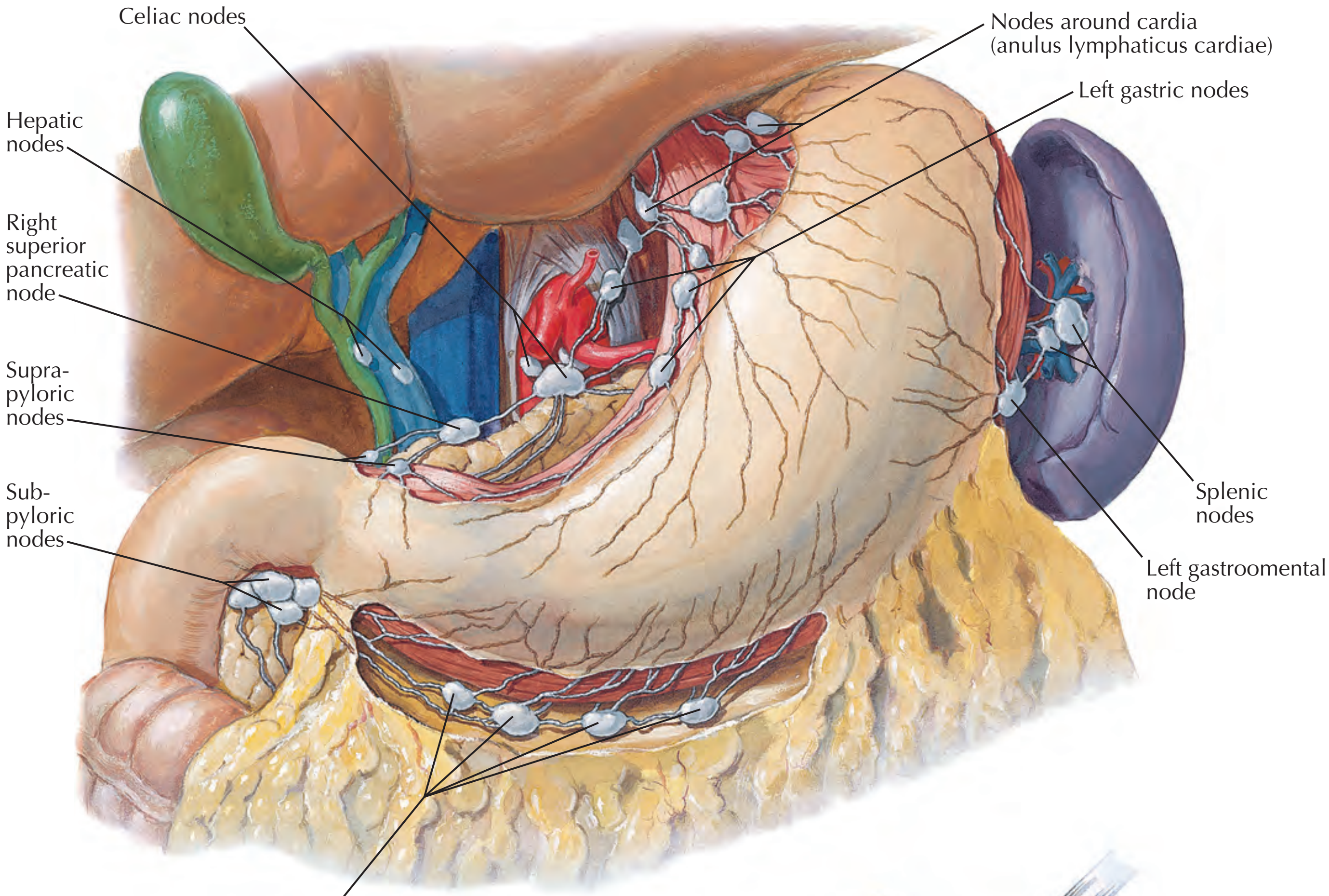
Nephron and Collecting Tubule: Schema

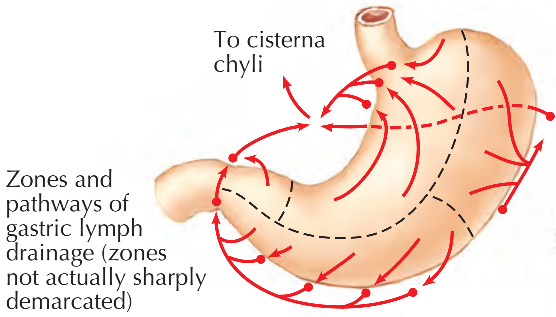

Fibrous capsule of kidney
Connecting tubules
Subcapsular zone
(cortex corticis)
Proximal convoluted tubule
Cortical
renal corpuscle
Distal convoluted tubule
Juxtamedullary
renal corpuscle
Proximal
convoluted
tubule
Distal
convoluted
tubule
Renal
cortex
Nephron loop (Henle's)
Descending limb
Ascending limb
Collecting duct
Outer zone of medulla
Outer
stripe
Inner
stripe
Nephron loop
(Henle's)
Collecting duct
Renal
medulla
(pyramid)
Inner zone of medulla
Descending
thin limb
Ascending
thin limb
Collecting
duct
Papillary duct
Openings
of papillary
ducts
Cribriform area of renal papilla
Renal corpuscle (malpighian):
glomerular capsule (Bowman's)
and glomerulus
Afferent and efferent
glomerular arterioles
Proximal tubule
Proximal
convoluted tubule
Proximal
straight tubule
Intermediate tubule
(thin tubule)
Nephron loop
(Henle's)
Distal tubule
Straight part
Distal
convoluted tubule
Macula densa
Connecting tubule and
collecting and papillary ducts
F. Netter M.D.

Blood Vessels in Parenchyma of Kidney: Schema

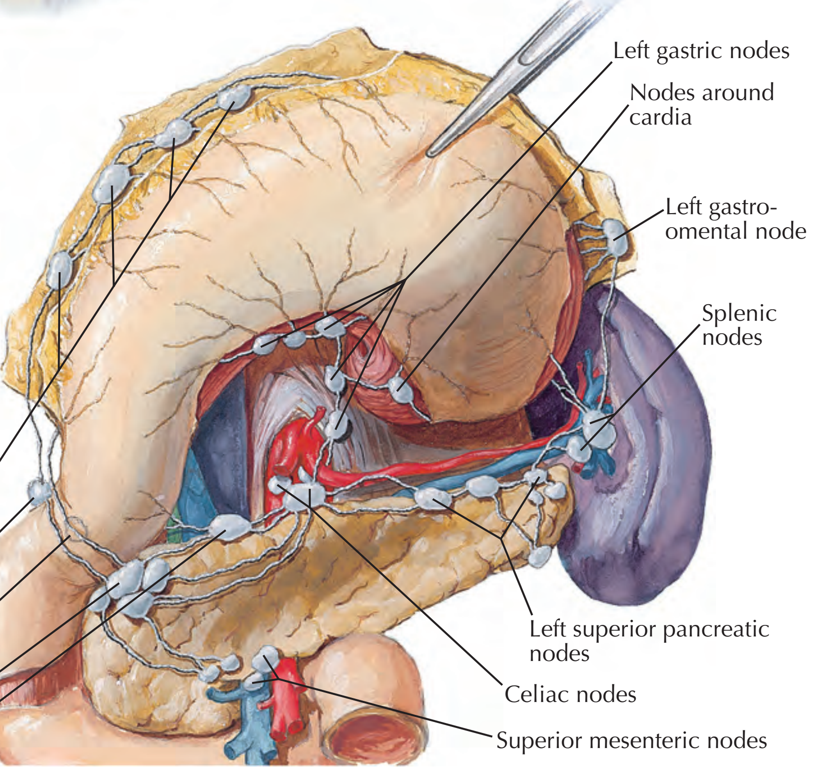

Afferent glomerular arteriole
Efferent glomerular arteriole (descends into renal pyramid)
Juxtamedullary glomerulus
Fibrous capsule of kidney
Superficial glomerulus
Efferent glomerular arteriole (joins cortical capillary plexus)
Cortical capillary plexus
Stellate vv.
Midcortical glomerulus
Efferent glomerular arteriole (joins cortical capillary plexus and also descends into renal pyramid)
Capsular v.
Perforating v.
Interlobular a. and v.
Subcapsular zone (cortex corticis)
Renal cortex
Arcuate a. and v.
Vasa recta spuria (arterioles from juxtamedullary efferent glomerular arterioles)
Vasa recta vera (arterioles from arcuate and interlobular aa.)
Venulae rectae
Medullary capillary plexus
Interlobar a. and v.
Renal column (of Bertin)
Nephron loop (Henle's)
Collecting ducts
Papillary duct
Interlobar a. and v. (in perirenal fat of renal sinus)
Renal medulla (pyramid)
F. Netter M.D.

Lymph Vessels and Lymph Nodes of Stomach

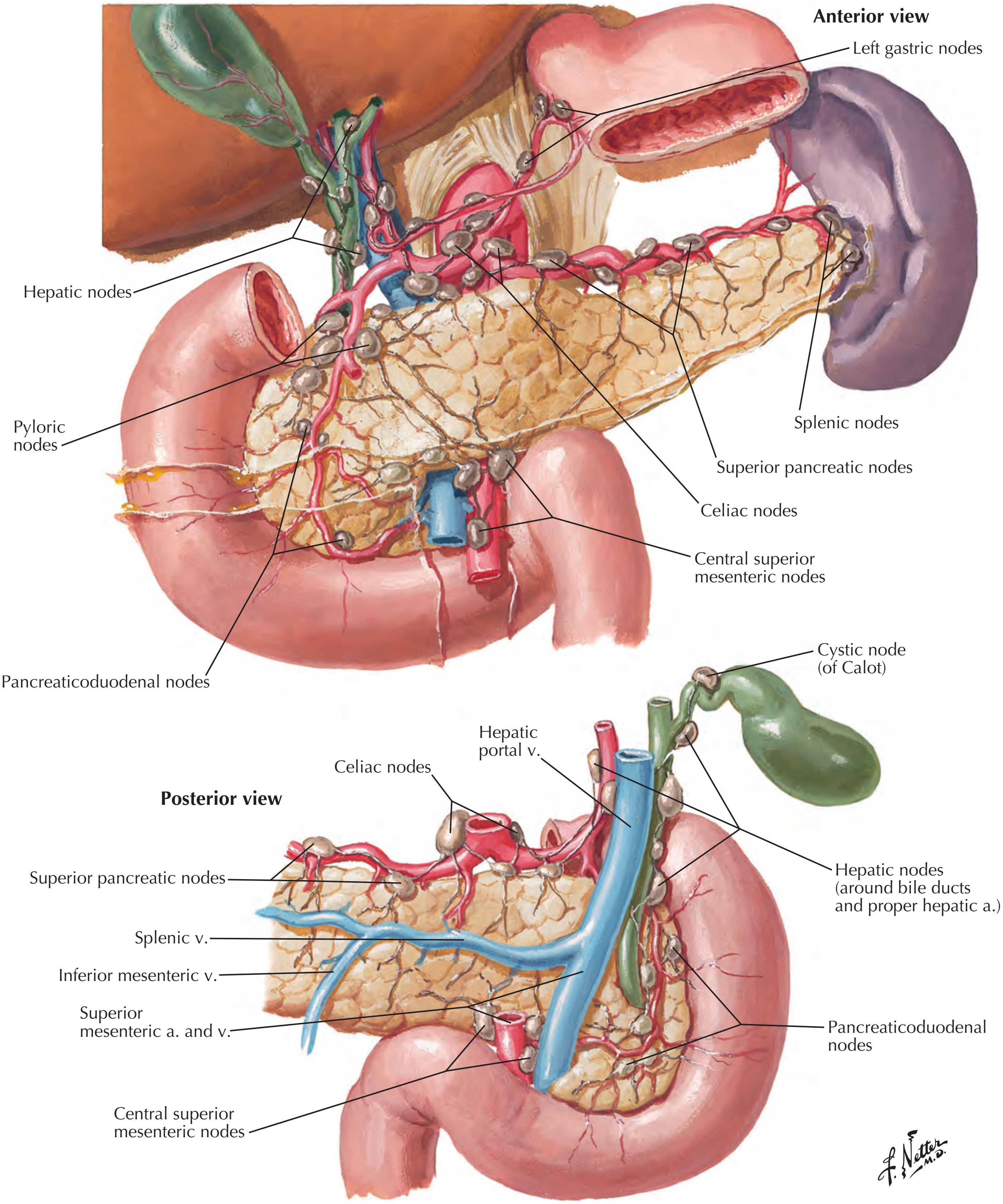

Celiac nodes
Nodes around cardia (anulus lymphaticus cardiae)
Left gastric nodes
Hepatic nodes
Right superior pancreatic node
Supra-pyloric nodes
Sub-pyloric nodes
Splenic nodes
Left gastroomental node
Right gastroomental nodes


To cisterna chyli

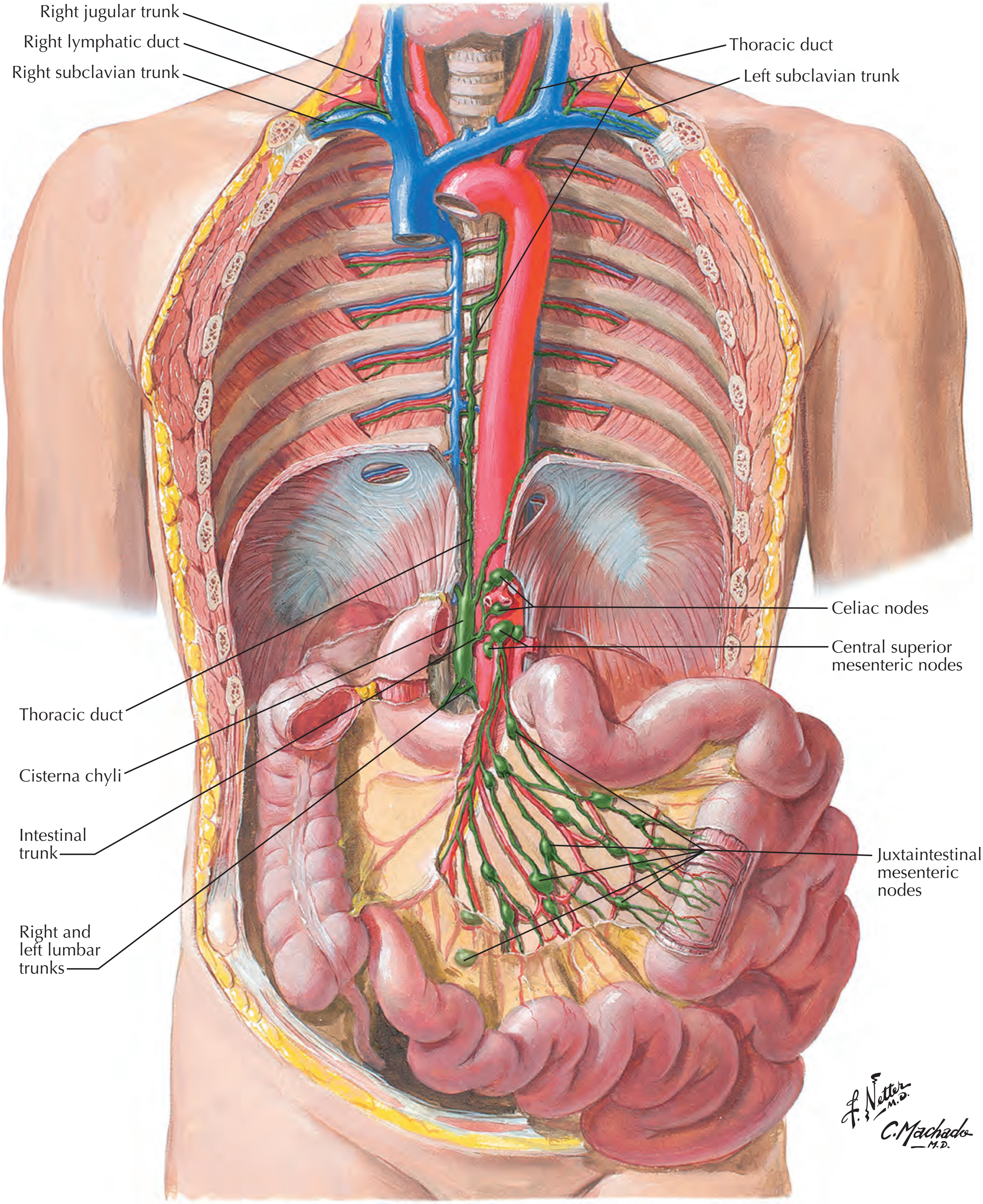
Zones and pathways of gastric lymph drainage (zones not actually sharply demarcated)

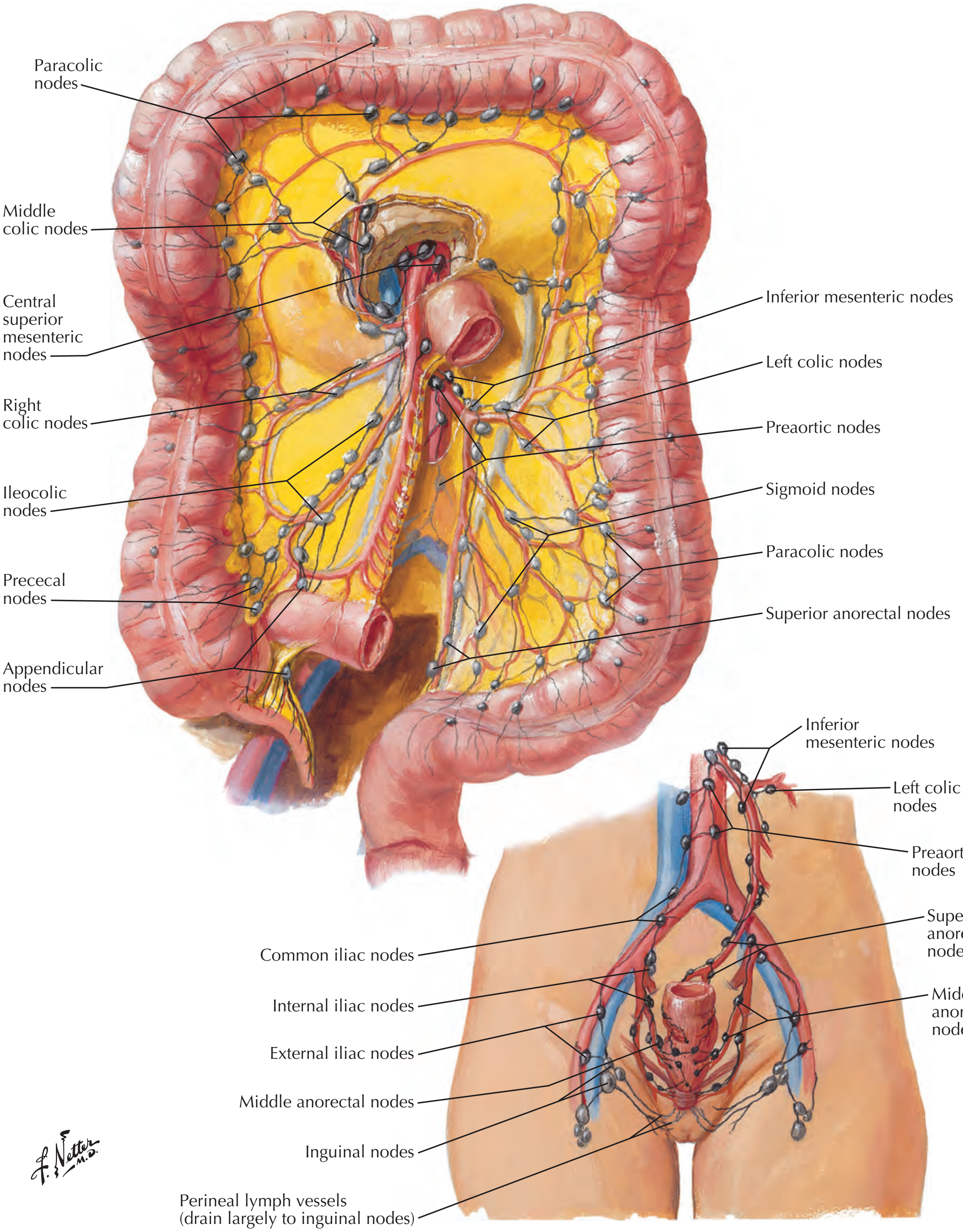

Left gastric nodes
Nodes around cardia
Left gastro-omental node
Splenic nodes
Right gastroomental nodes
Suprapyloric node
Retropyloric node
Subpyloric node
Right superior pancreatic node
Left superior pancreatic nodes
Celiac nodes
Superior mesenteric nodes

Lymph Vessels and Lymph Nodes of Pancreas

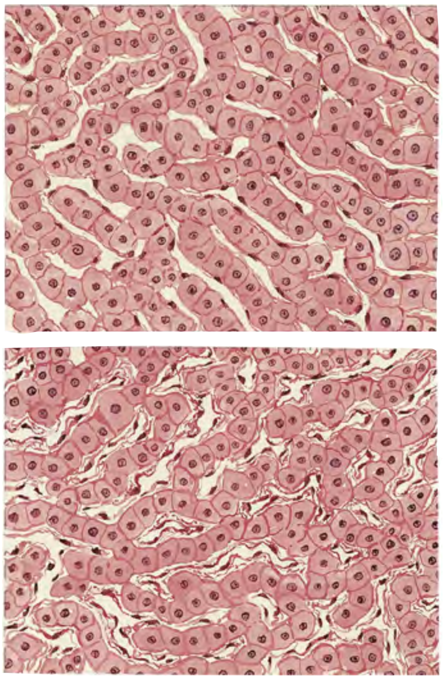

Anterior view
Left gastric nodes
Hepatic nodes
Pyloric nodes
Splenic nodes
Superior pancreatic nodes
Celiac nodes
Central superior mesenteric nodes
Pancreaticoduodenal nodes
Cystic node (of Calot)
Hepatic portal v.
Celiac nodes
Posterior view
Superior pancreatic nodes
Splenic v.
Inferior mesenteric v.
Superior mesenteric a. and v.
Central superior mesenteric nodes
Hepatic nodes (around bile ducts and proper hepatic a.)
Pancreaticoduodenal nodes
F. Netter M.D.

Lymph Vessels and Lymph Nodes of Small Intestine


Right jugular trunk
Right lymphatic duct
Right subclavian trunk
Thoracic duct
Left subclavian trunk
Celiac nodes
Central superior mesenteric nodes
Thoracic duct
Cisterna chyli
Intestinal trunk
Right and left lumbar trunks
Juxtaintestinal mesenteric nodes
F. Netter M.D.
C. Machado M.D.


Paracolic nodes
Middle colic nodes
Central superior mesenteric nodes
Right colic nodes
Ileocolic nodes
Prececal nodes
Appendicular nodes
Inferior mesenteric nodes
Left colic nodes
Preaortic nodes
Sigmoid nodes
Paracolic nodes
Superior anorectal nodes
Inferior mesenteric nodes
Left colic nodes
Preaortic nodes
Superior anorectal nodes
Middle anorectal nodes
Common iliac nodes
Internal iliac nodes
External iliac nodes
Middle anorectal nodes
Inguinal nodes
Perineal lymph vessels (drain largely to inguinal nodes)
F. Netter M.D.

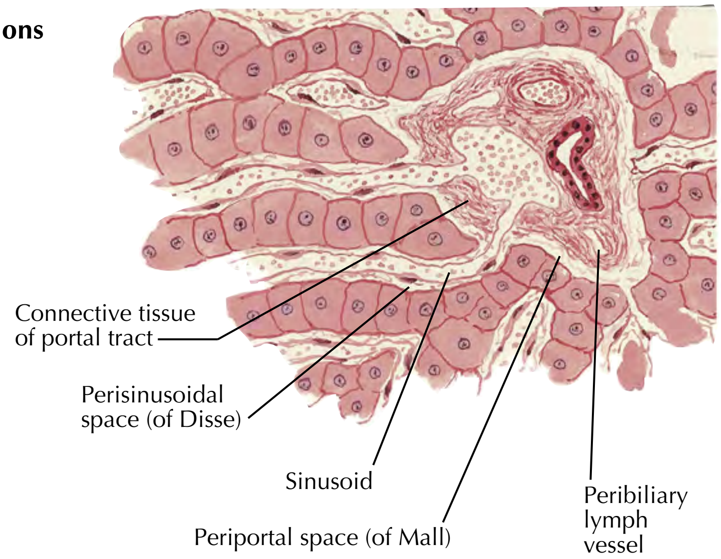
Lymph Vessels and Lymph Nodes of Liver

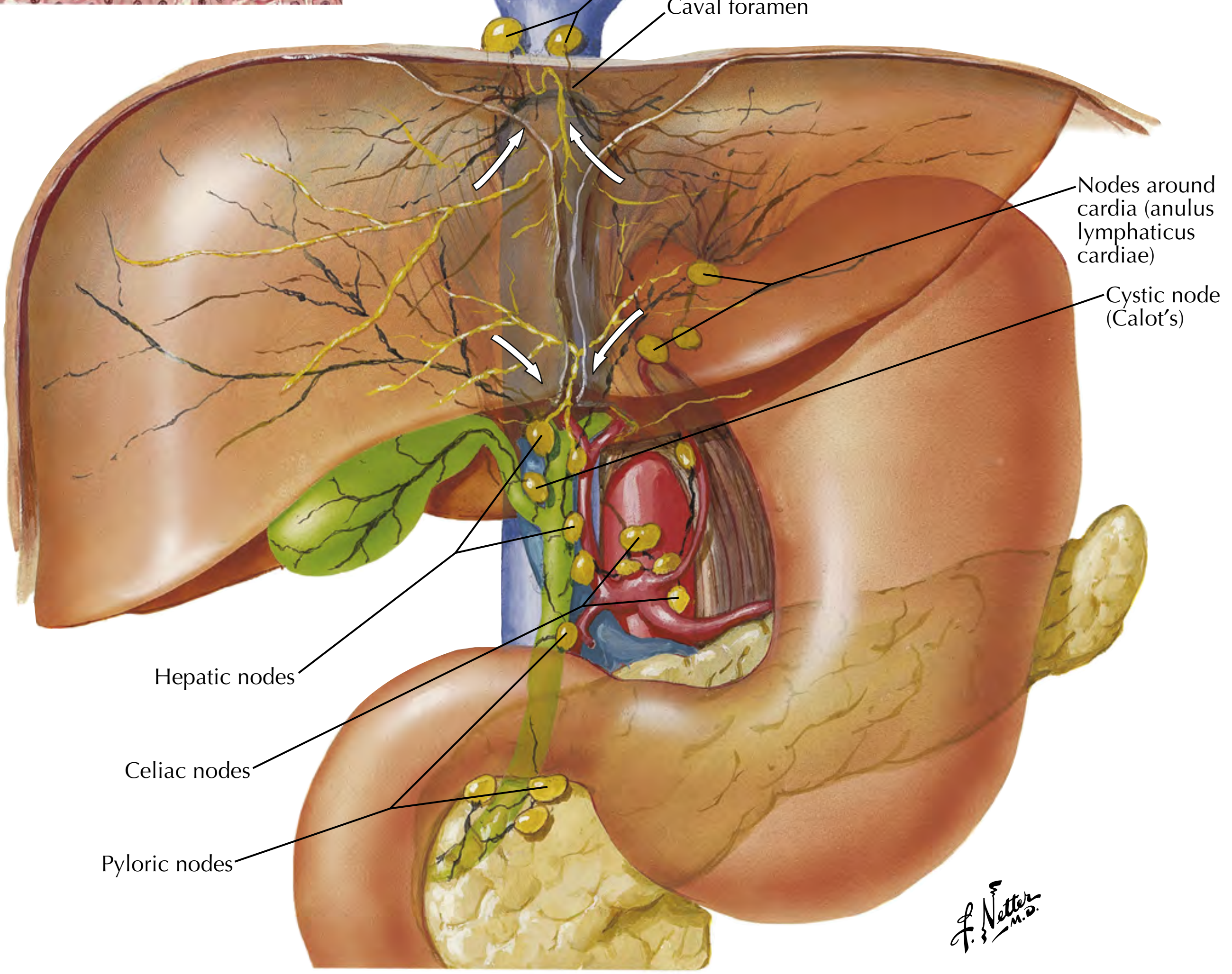


Low-power sections of liver

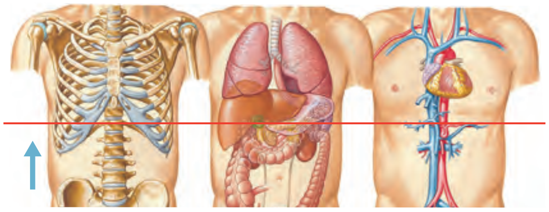
Perisinusoidal spaces (of Disse) very narrow or obliterated

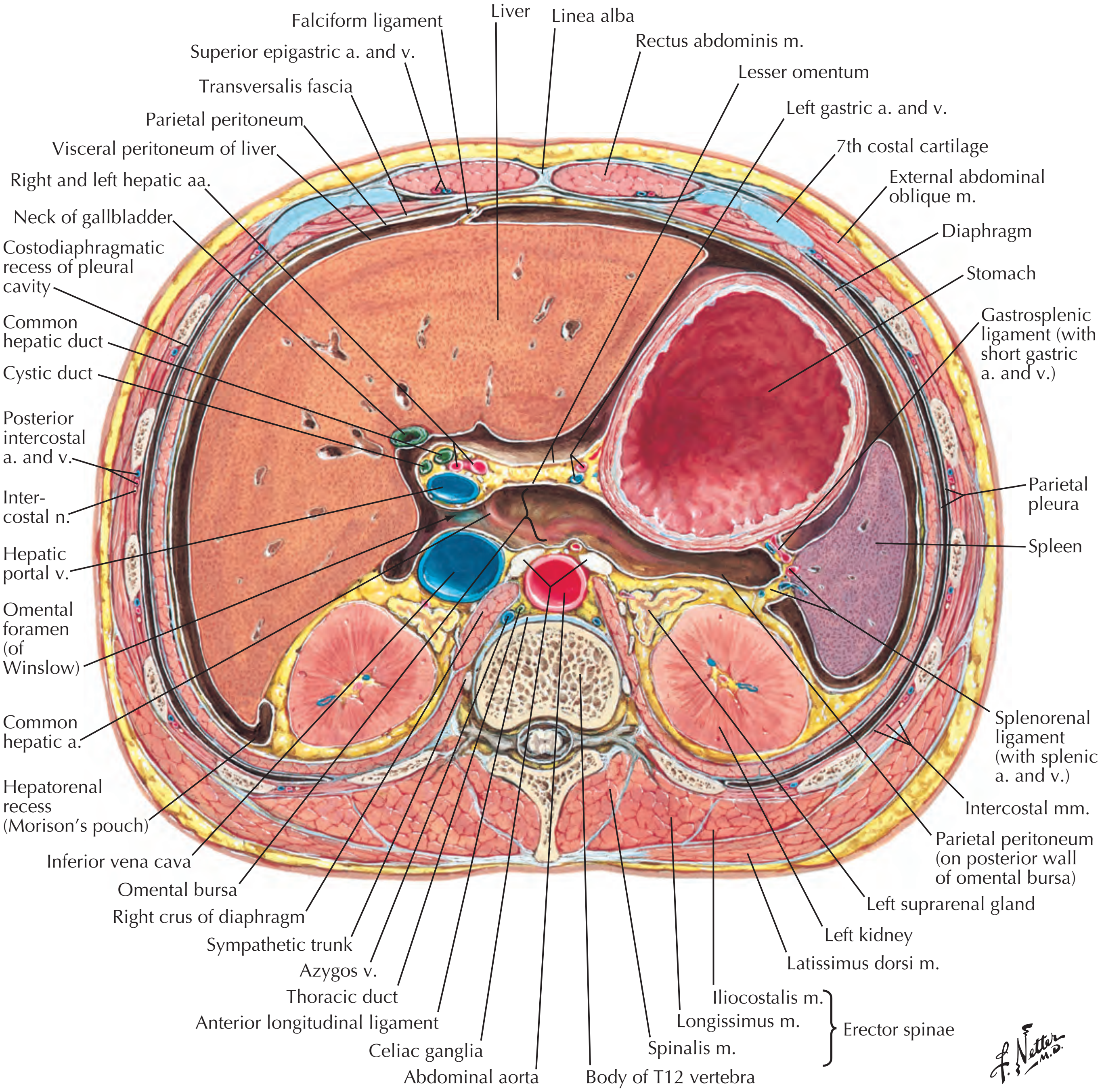
Perisinusoidal spaces (of Disse) markedly widened


Connective tissue of portal tract
Perisinusoidal space (of Disse)
Sinusoid
Periportal space (of Mall)
Peribiliary lymph vessel

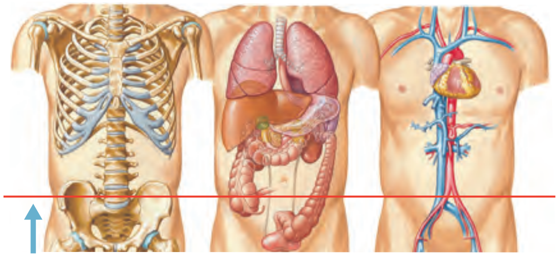

Superior diaphragmatic nodes
Caval foramen
Nodes around cardia (anulus lymphaticus cardiae)
Cystic node (Calot's)
Hepatic nodes
Celiac nodes
Pyloric nodes

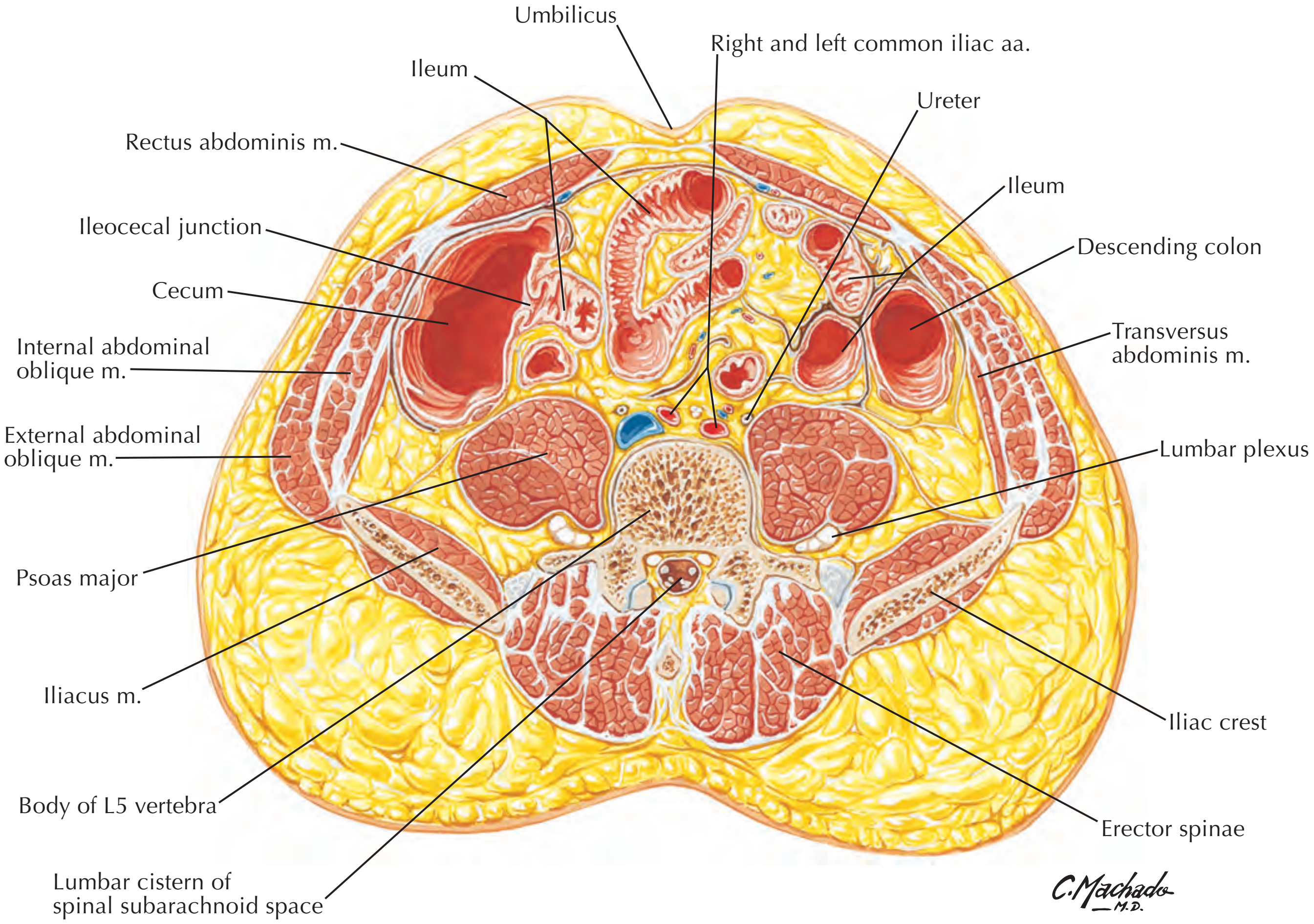
Schematic Cross Section of Abdomen at T12 Vertebral Level




Falciform ligament
Liver
Linea alba
Rectus abdominis m.
Superior epigastric a. and v.
Lesser omentum
Transversalis fascia
Left gastric a. and v.
Parietal peritoneum
7th costal cartilage
Visceral peritoneum of liver
External abdominal oblique m.
Right and left hepatic aa.
Diaphragm
Neck of gallbladder
Costodiaphragmatic recess of pleural cavity
Stomach
Gastrosplenic ligament (with short gastric a. and v.)
Common hepatic duct
Cystic duct
Posterior intercostal a. and v.
Parietal pleura
Inter-costal n.
Spleen
Hepatic portal v.
Omental foramen (of Winslow)
Common hepatic a.
Splenorenal ligament (with splenic a. and v.)
Hepatorenal recess (Morison's pouch)
Intercostal mm.
Parietal peritoneum (on posterior wall of omental bursa)
Inferior vena cava
Omental bursa
Left suprarenal gland
Right crus of diaphragm
Left kidney
Sympathetic trunk
Latissimus dorsi m.
Azygos v.
Thoracic duct
Iliocostalis m.
Anterior longitudinal ligament
Longissimus m.
Erector spinae
Celiac ganglia
Spinalis m.
Abdominal aorta
Body of T12 vertebra
F. Netter M.D.

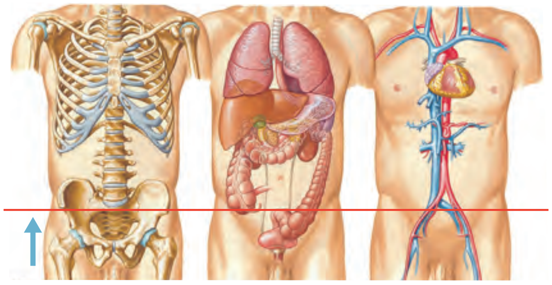
Transverse Section of Abdomen: L5 Vertebral Level, Near Transtubercular Plane

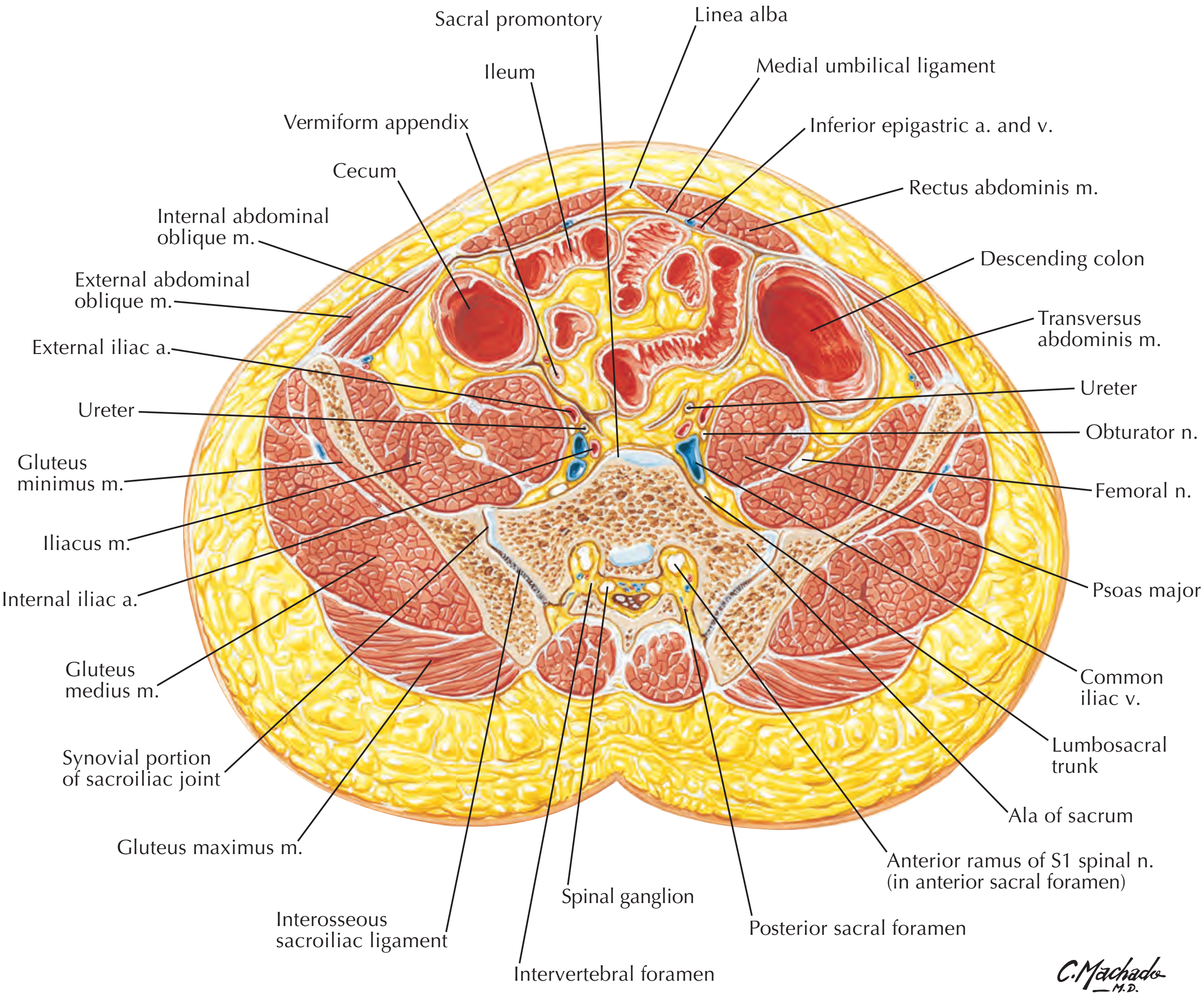




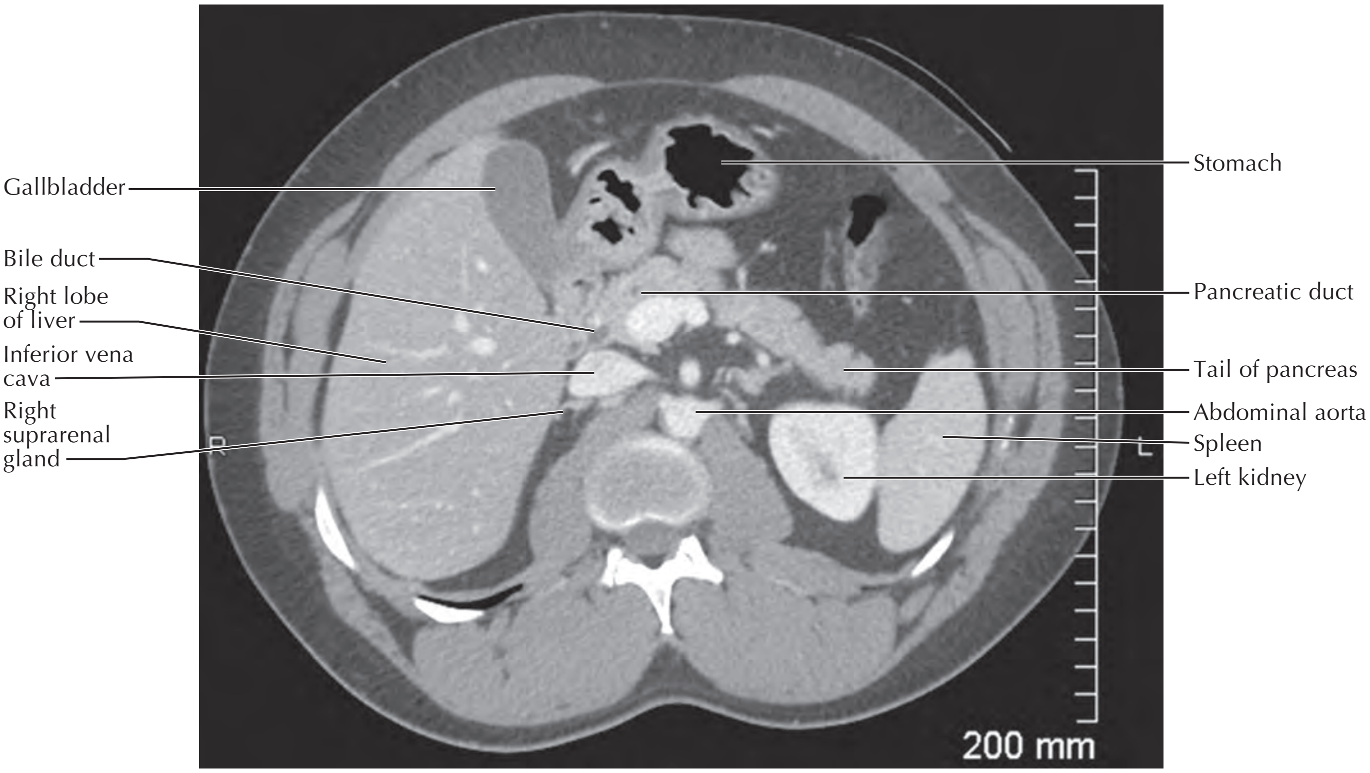
Umbilicus
Right and left common iliac aa.
Ileum
Ureter
Rectus abdominis m.
Ileum
Ileocecal junction
Descending colon
Cecum
Transversus abdominis m.
Internal abdominal oblique m.
External abdominal oblique m.
Lumbar plexus
Psoas major
Iliacus m.
Iliac crest
Body of L5 vertebra
Erector spinae
Lumbar cistern of spinal subarachnoid space
C. Machado M.D.

Transverse Section of Abdomen: S1 Vertebral Level, Anterior Superior Iliac Spine

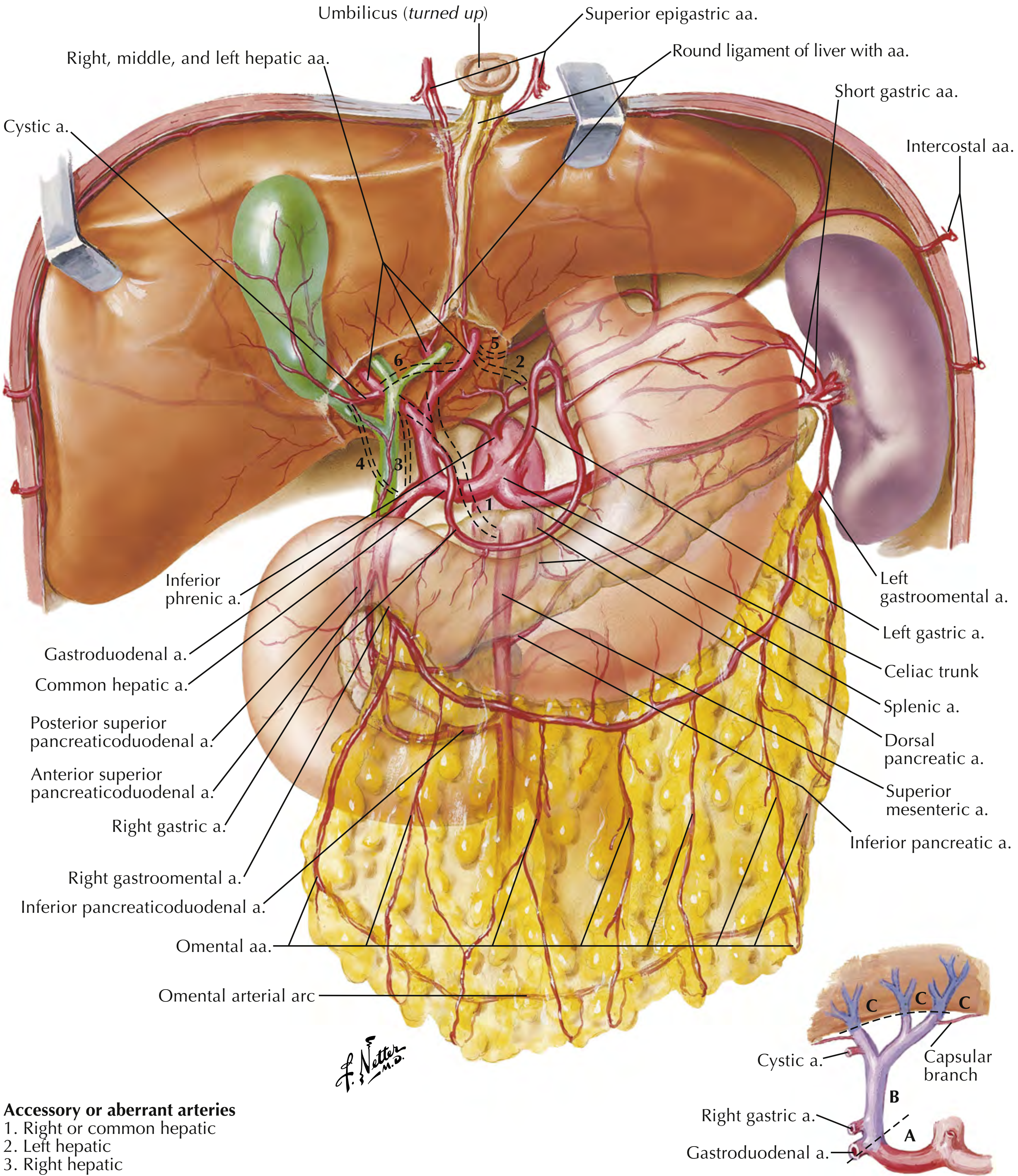



Sacral promontory
Linea alba
Ileum
Medial umbilical ligament
Vermiform appendix
Inferior epigastric a. and v.
Cecum
Rectus abdominis m.
Internal abdominal oblique m.
Descending colon
External abdominal oblique m.
Transversus abdominis m.
External iliac a.
Ureter
Ureter
Obturator n.
Gluteus minimus m.
Femoral n.
Iliacus m.
Psoas major
Internal iliac a.
Gluteus medius m.
Common iliac v.
Lumbosacral trunk
Synovial portion of sacroiliac joint
Ala of sacrum
Gluteus maximus m.
Anterior ramus of S1 spinal n. (in anterior sacral foramen)
Spinal ganglion
Interosseous sacroiliac ligament
Posterior sacral foramen
Intervertebral foramen
C. Machado M.D.

Axial CT image enhanced with intravenous contrast


Gallbladder
Bile duct
Right lobe of liver
Inferior vena cava
Right suprarenal gland
Stomach
Pancreatic duct
Tail of pancreas
Abdominal aorta
Spleen
Left kidney
R
L
200 mm

Arterial Variations and Collateral Supply of Liver and Gallbladder


Umbilicus (*turned up*)
Superior epigastric aa.
Round ligament of liver with aa.
Right, middle, and left hepatic aa.
Short gastric aa.
Cystic a.
Intercostal aa.
6
5
2
4
3
1
Inferior phrenic a.
Left gastroomental a.
Left gastric a.
Gastroduodenal a.
Common hepatic a.
Celiac trunk
Splenic a.
Posterior superior pancreaticoduodenal a.
Dorsal pancreatic a.
Anterior superior pancreaticoduodenal a.
Superior mesenteric a.
Right gastric a.
Inferior pancreatic a.
Right gastroomental a.
Inferior pancreaticoduodenal a.
Omental aa.
Omental arterial arc
F. Netter M.D.
C
C
C
Cystic a.
Capsular branch
B
Right gastric a.
A
Gastroduodenal a.

Accessory or aberrant arteries
1. Right or common hepatic
2. Left hepatic
3. Right hepatic
4. Cystic

Arterial anastomoses (variants)
5. Inferior phrenic/left gastric ⟷ left hepatic
6. Right hepatic ⟷ left hepatic

Effects of hepatic artery obstruction
A. Zone of relative safety
B. Zone of questionable effects
C. Zone of inevitable infarction

PELVIS

6

Surface Anatomy 352
Bony Pelvis 353–357
Pelvic Diaphragm and Viscera 358–368
Urinary Bladder 369–371
Female Internal Genitalia 372–376
Female Perineum and External Genitalia 377–380
Male Perineum and External Genitalia 381–388
Homologies of Male and Female Genitalia 389–390
Male Internal Genitalia 391–392
Rectum and Anal Canal 393–399
Vasculature 400–410
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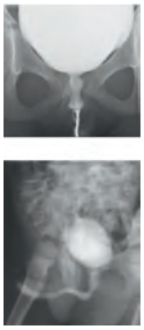
Structures with High Clinical Significance Tables 6.1–6.3
Muscles Table 6.4
Electronic Bonus Plates BP 84–BP 95

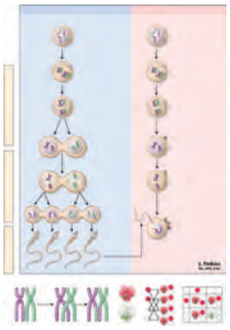
ELECTRONIC BONUS PLATES

BP 84 Fasciae of Pelvis and Perineum: Male and Female



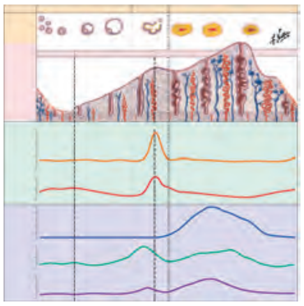
BP 85 Cystourethrograms: Male and Female

BP 86 Female Urethra



BP 87 Genetics of Reproduction

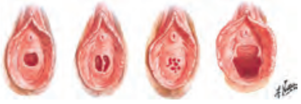
ELECTRONIC BONUS PLATES—*cont'd*



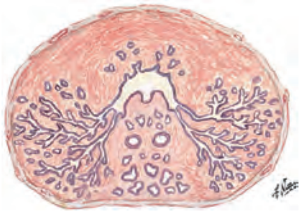
BP 88 Menstrual Cycle

BP 89 Uterine Development

BP 90 Ovary, Oocytes, and Follicles



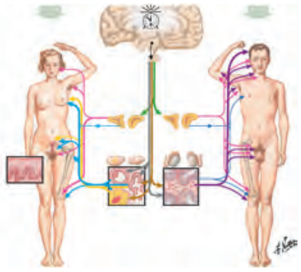
BP 91 Variations in Hymen



BP 92 Cross Section of Pelvis Through Prostate

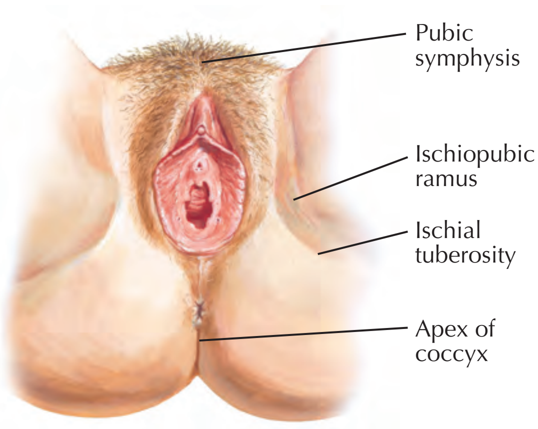
BP 93 Arteries and Veins of Pelvis: Male (Featuring Prostate)

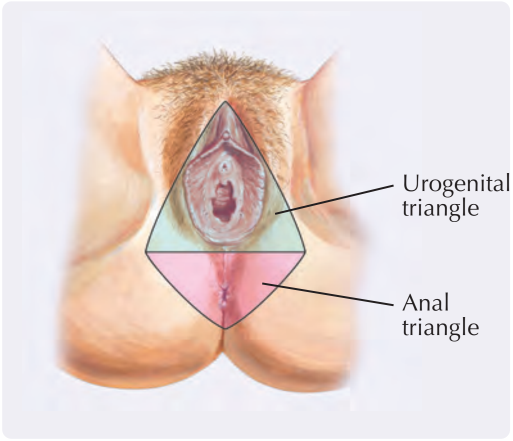
BP 94 Cross Section of Pelvis Through Vesicoprostatic Junction

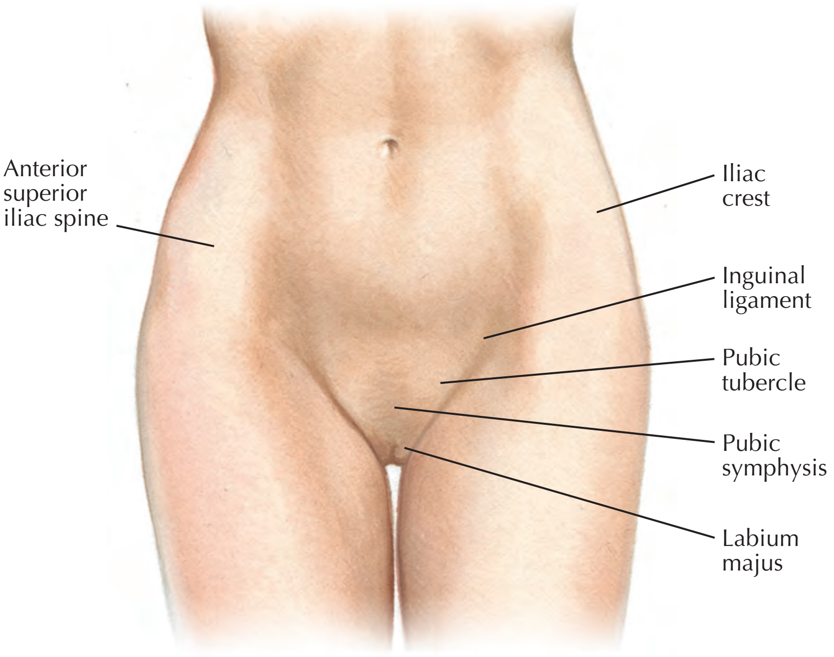


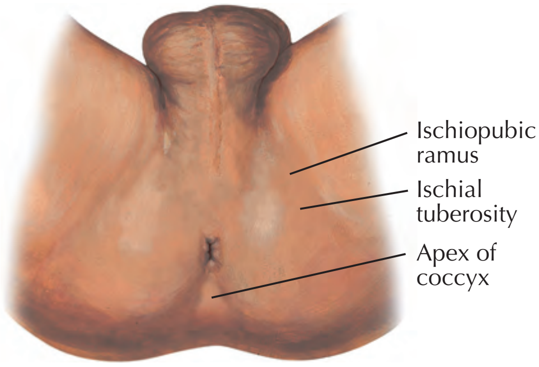
BP 95 Endocrine Glands, Hormones, and Puberty

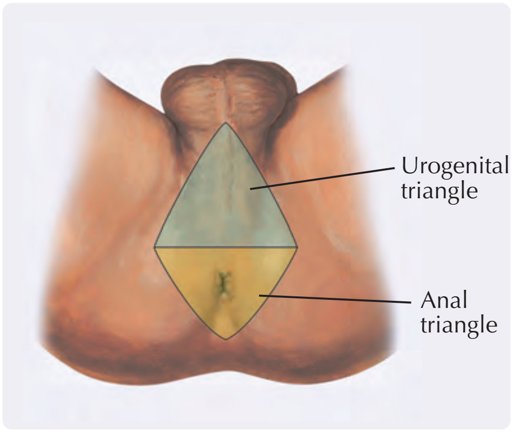
See also **Plates 188, 267**

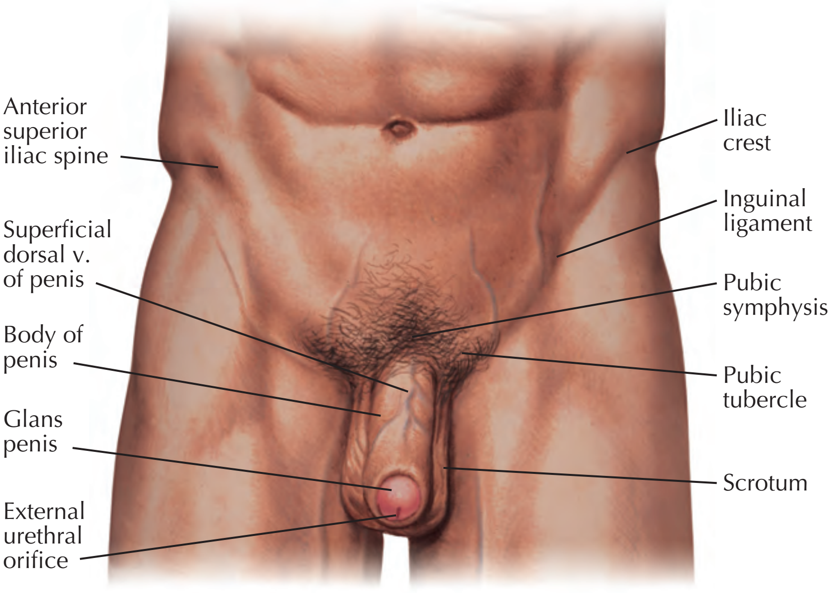

Pubic symphysis
Ischiopubic ramus
Ischial tuberosity
Apex of coccyx


Urogenital triangle
Anal triangle


Anterior superior iliac spine
Iliac crest
Inguinal ligament
Pubic tubercle
Pubic symphysis
Labium majus

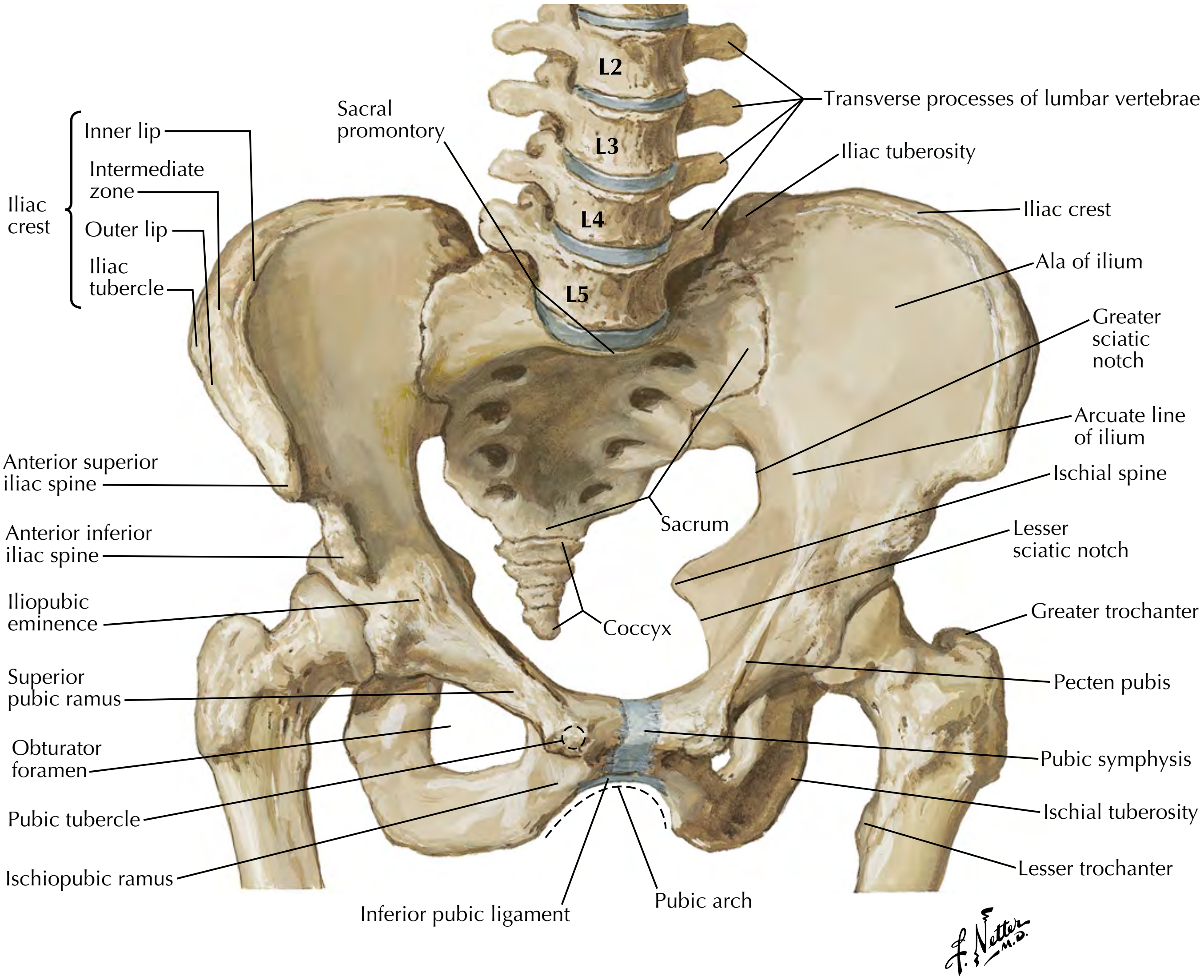

Ischiopubic ramus
Ischial tuberosity
Apex of coccyx


Urogenital triangle
Anal triangle

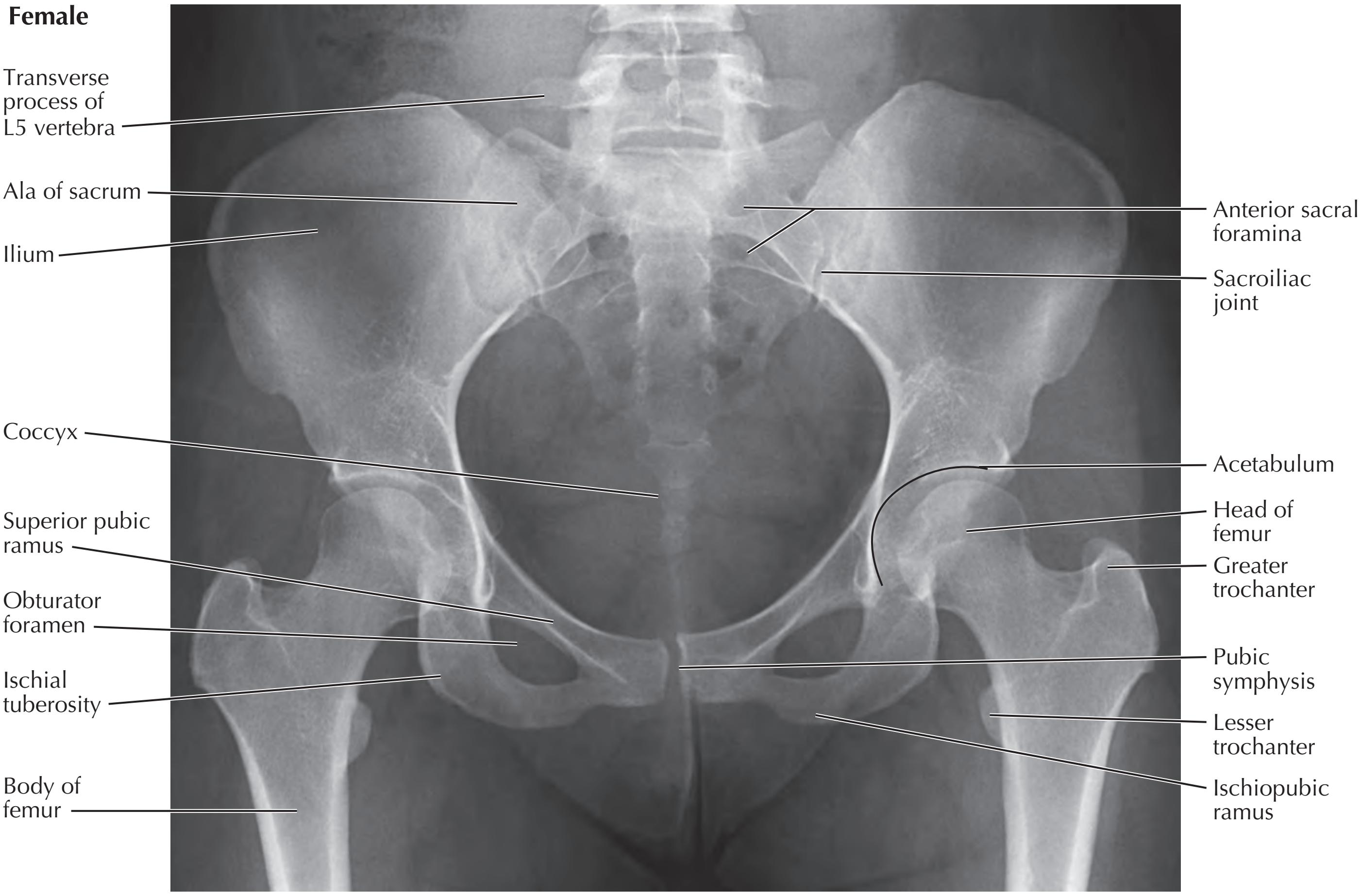

Anterior superior iliac spine
Superficial dorsal v. of penis
Body of penis
Glans penis
External urethral orifice
Iliac crest
Inguinal ligament
Pubic symphysis
Pubic tubercle
Scrotum

F. Netter M.D. C.Machado M.D.

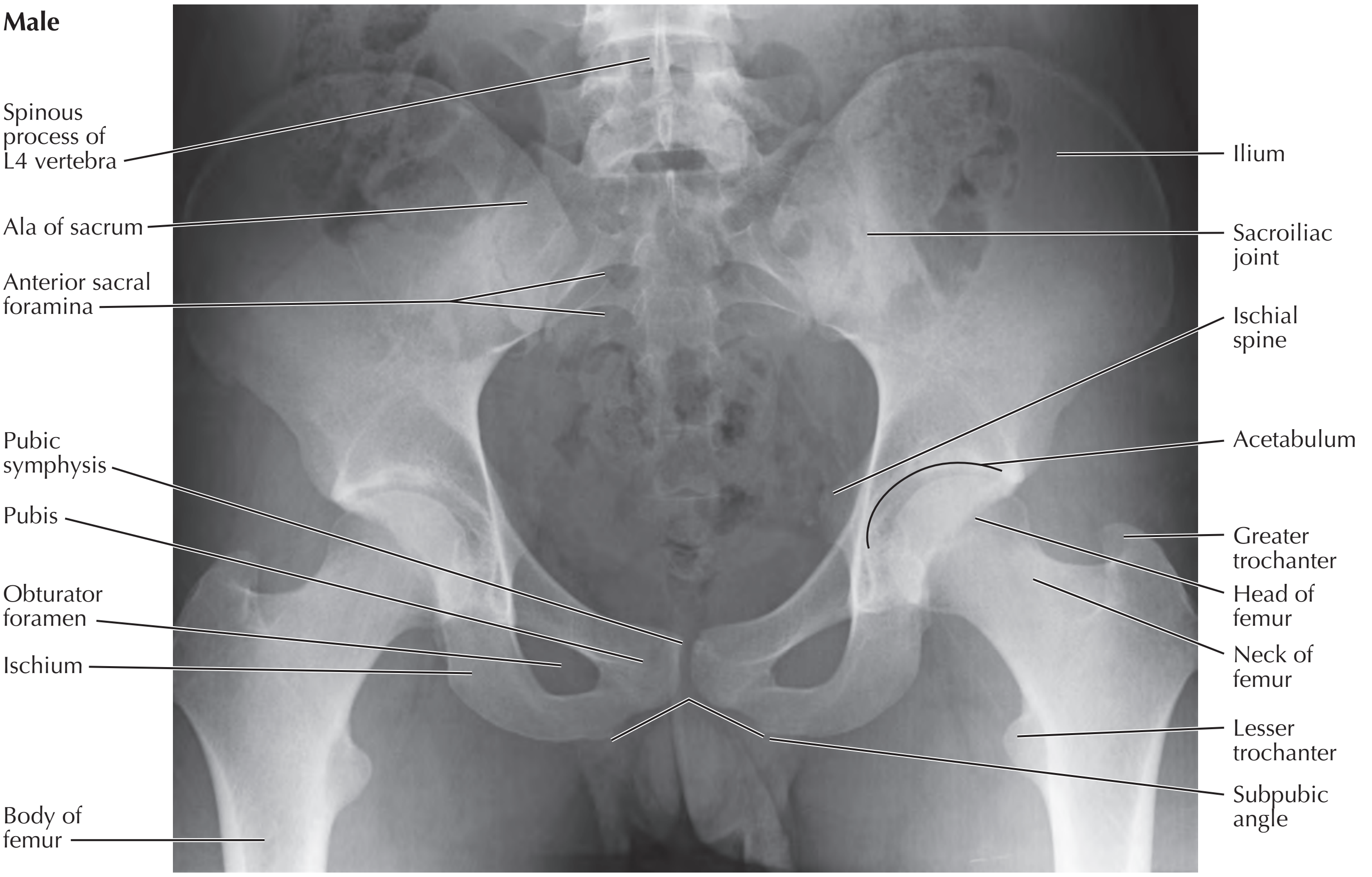
Bony Framework of Pelvis


L2
L3
L4
L5
Transverse processes of lumbar vertebrae
Sacral promontory
Iliac tuberosity
Iliac crest
Inner lip
Intermediate zone
Outer lip
Iliac tubercle
Iliac crest
Ala of ilium
Greater sciatic notch
Arcuate line of ilium
Ischial spine
Anterior superior iliac spine
Sacrum
Lesser sciatic notch
Anterior inferior iliac spine
Iliopubic eminence
Coccyx
Greater trochanter
Superior pubic ramus
Pecten pubis
Obturator foramen
Pubic symphysis
Pubic tubercle
Ischial tuberosity
Ischiopubic ramus
Lesser trochanter
Inferior pubic ligament
Pubic arch
F. Netter M.D.

Female

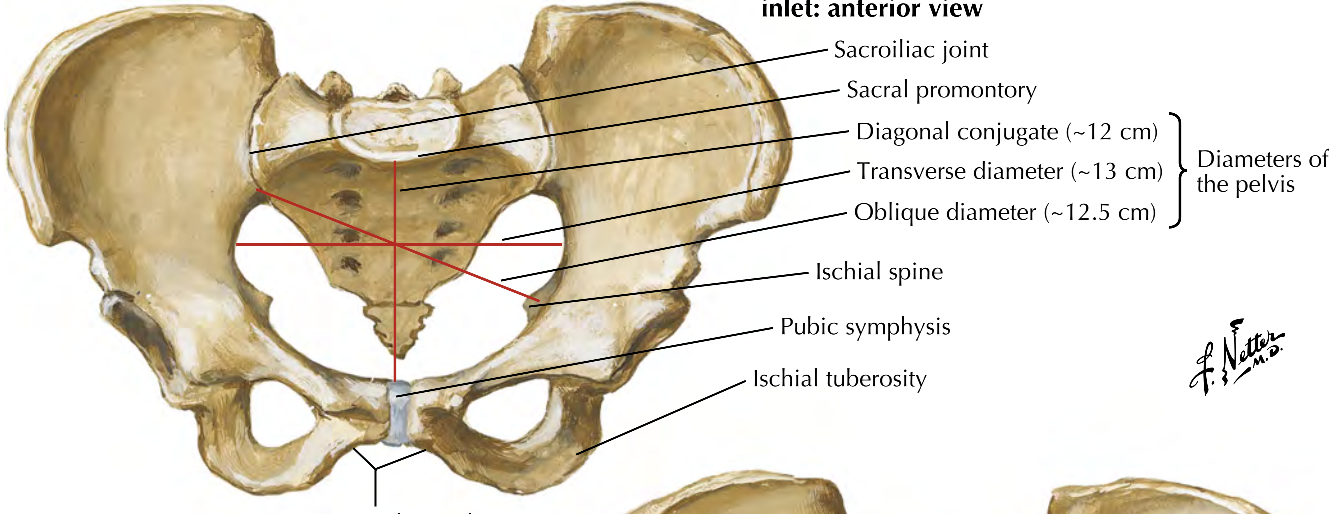

Transverse process of L5 vertebra
Ala of sacrum
Ilium
Coccyx
Superior pubic ramus
Obturator foramen
Ischial tuberosity
Body of femur
Anterior sacral foramina
Sacroiliac joint
Acetabulum
Head of femur
Greater trochanter
Pubic symphysis
Lesser trochanter
Ischiopubic ramus

Male


Spinous process of L4 vertebra
Ala of sacrum
Anterior sacral foramina
Pubic symphysis
Pubis
Obturator foramen
Ischium
Body of femur
Ilium
Sacroiliac joint
Ischial spine
Acetabulum
Greater trochanter
Head of femur
Neck of femur
Lesser trochanter
Subpubic angle

Sex Differences of Bony Pelvis: Measurements

See also **Plate 268**

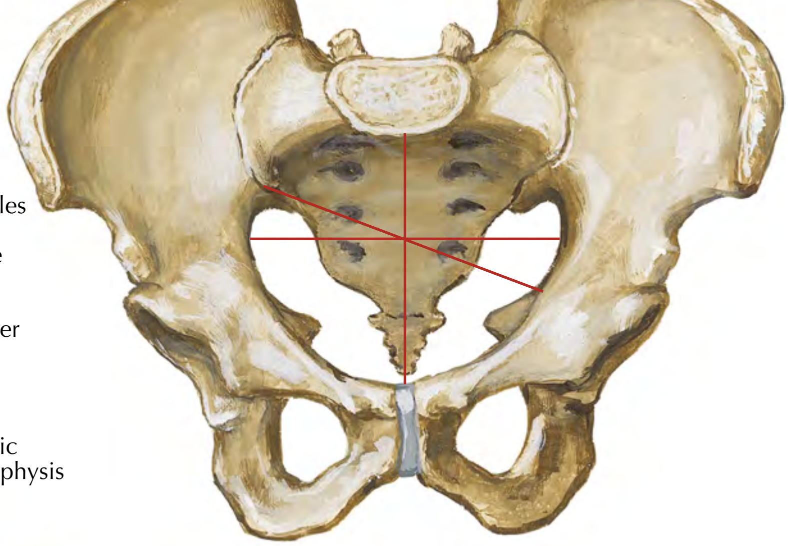

Sacroiliac joint
Sacral promontory
Diagonal conjugate (~12 cm)
Transverse diameter (~13 cm)
Oblique diameter (~12.5 cm)
Diameters of the pelvis
Ischial spine
Pubic symphysis
Ischial tuberosity
Pubic arch

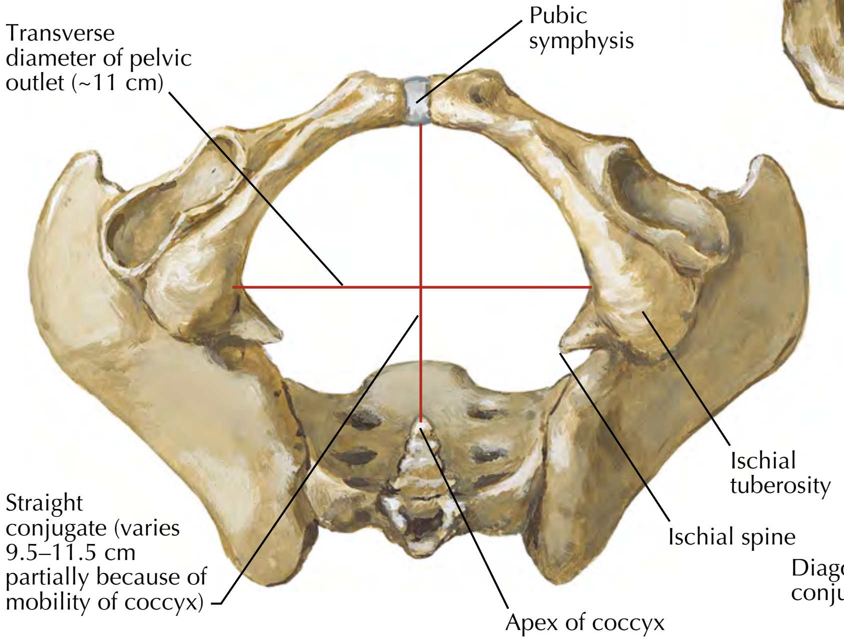
Female bony pelvis/female pelvic inlet: anterior view

Male bony pelvis/male pelvic inlet: anterior view

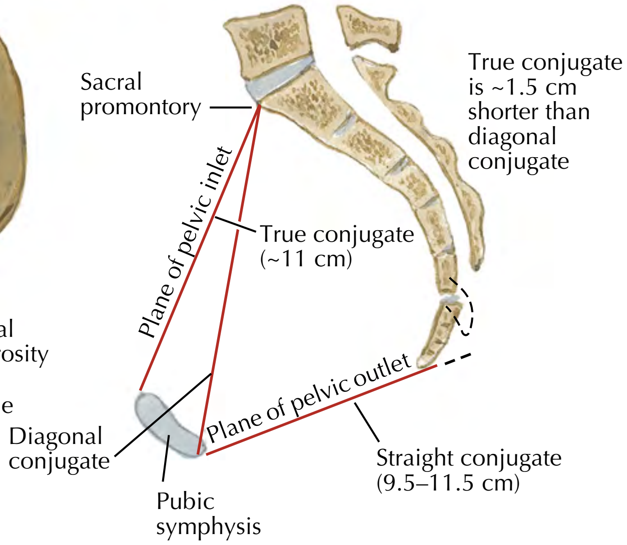
Diagonal conjugate is only diameter of pelvic inlet (superior pelvic aperture) that can be measured clinically

- All measurements slightly shorter in relation to body size than in females
- Pelvic inlet oriented more anteroposteriorly than in females, where it tends to be transversely oval
- Pubic symphysis deeper (longer)
- Pubic arch (subpubic angle) narrower
- Ischial tuberosities less far apart
- Iliac alae less flared




Transverse diameter of pelvic outlet (~11 cm)
Pubic symphysis
Ischial tuberosity
Ischial spine
Straight conjugate (varies 9.5–11.5 cm partially because of mobility of coccyx)
Apex of coccyx

Female bony pelvis/female pelvic outlet: inferior view

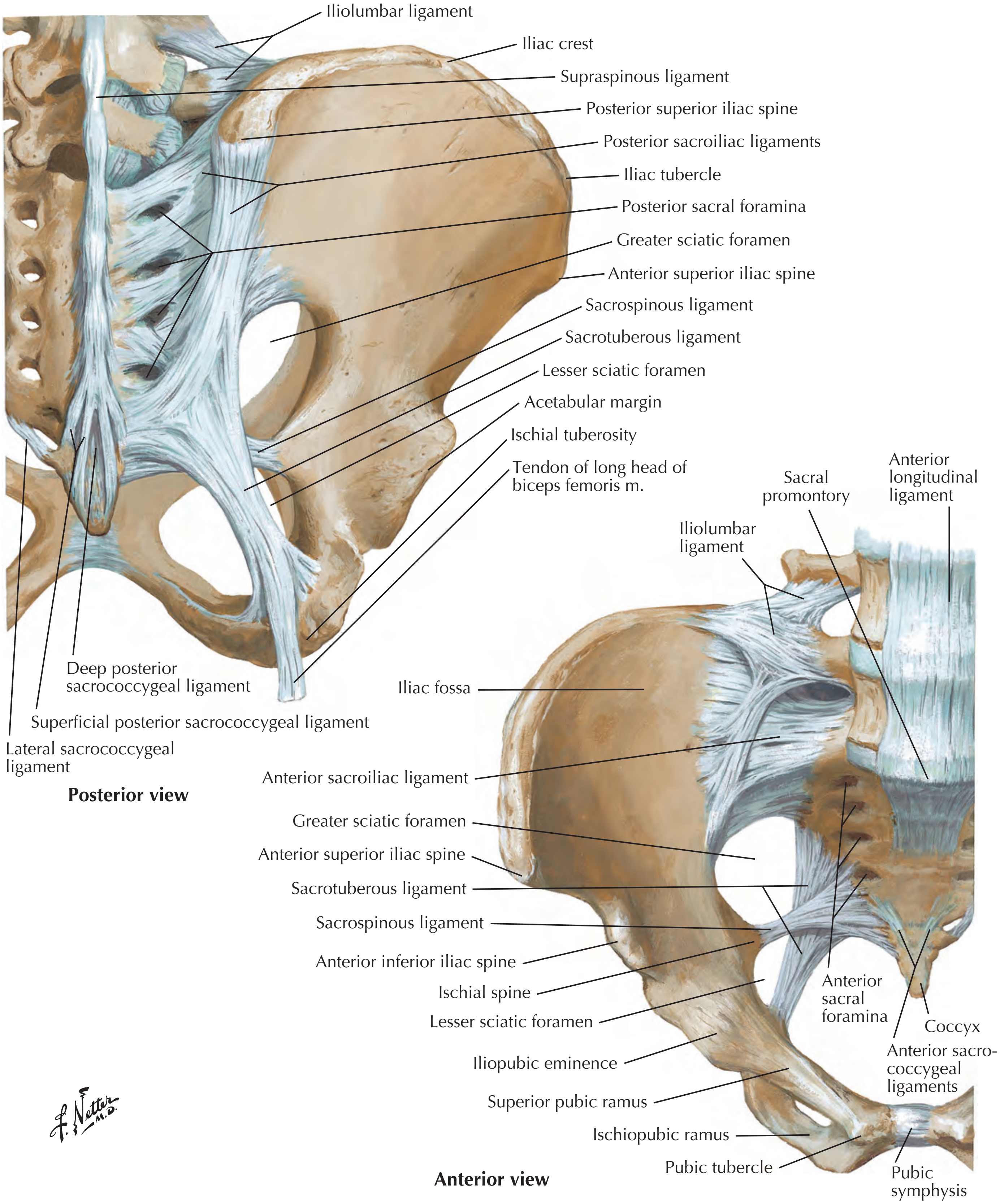

Sacral promontory
True conjugate is ~1.5 cm shorter than diagonal conjugate
Plane of pelvic inlet
True conjugate (~11 cm)
Plane of pelvic outlet
Diagonal conjugate
Straight conjugate (9.5–11.5 cm)
Pubic symphysis

Transverse diameter is the widest distance of pelvic inlet

Female: sagittal section

Ligaments of Bony Pelvis

See also Plate 184

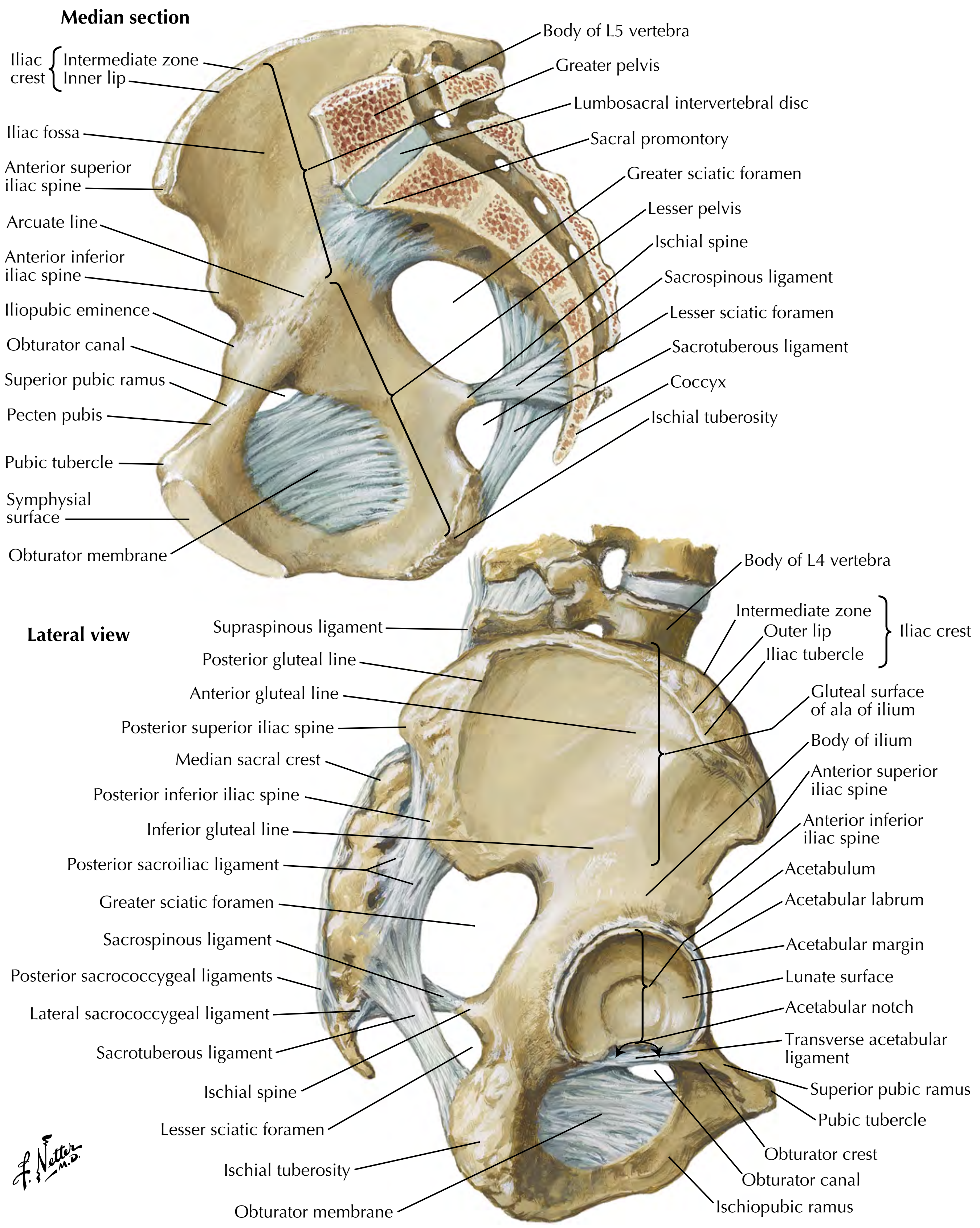

Iliolumbar ligament
Iliac crest
Supraspinous ligament
Posterior superior iliac spine
Posterior sacroiliac ligaments
Iliac tubercle
Posterior sacral foramina
Greater sciatic foramen
Anterior superior iliac spine
Sacrospinous ligament
Sacrotuberous ligament
Lesser sciatic foramen
Acetabular margin
Ischial tuberosity
Tendon of long head of biceps femoris m.
Deep posterior sacrococcygeal ligament
Superficial posterior sacrococcygeal ligament
Lateral sacrococcygeal ligament
Sacral promontory
Anterior longitudinal ligament
Iliolumbar ligament
Iliac fossa
Anterior sacroiliac ligament
Greater sciatic foramen
Anterior superior iliac spine
Sacrotuberous ligament
Sacrospinous ligament
Anterior inferior iliac spine
Ischial spine
Lesser sciatic foramen
Iliopubic eminence
Superior pubic ramus
Ischiopubic ramus
Pubic tubercle
Anterior sacral foramina
Coccyx
Anterior sacrococcygeal ligaments
Pubic symphysis
F. Netter M.D.

Posterior view

Anterior view

Ligaments of Hip Bone

See also **Plate 184**



Median section

Iliac crest
Intermediate zone
Inner lip
Iliac fossa
Anterior superior iliac spine
Arcuate line
Anterior inferior iliac spine
Iliopubic eminence
Obturator canal
Superior pubic ramus
Pecten pubis
Pubic tubercle
Symphysial surface
Obturator membrane
Body of L5 vertebra
Greater pelvis
Lumbosacral intervertebral disc
Sacral promontory
Greater sciatic foramen
Lesser pelvis
Ischial spine
Sacrospinous ligament
Lesser sciatic foramen
Sacrotuberous ligament
Coccyx
Ischial tuberosity

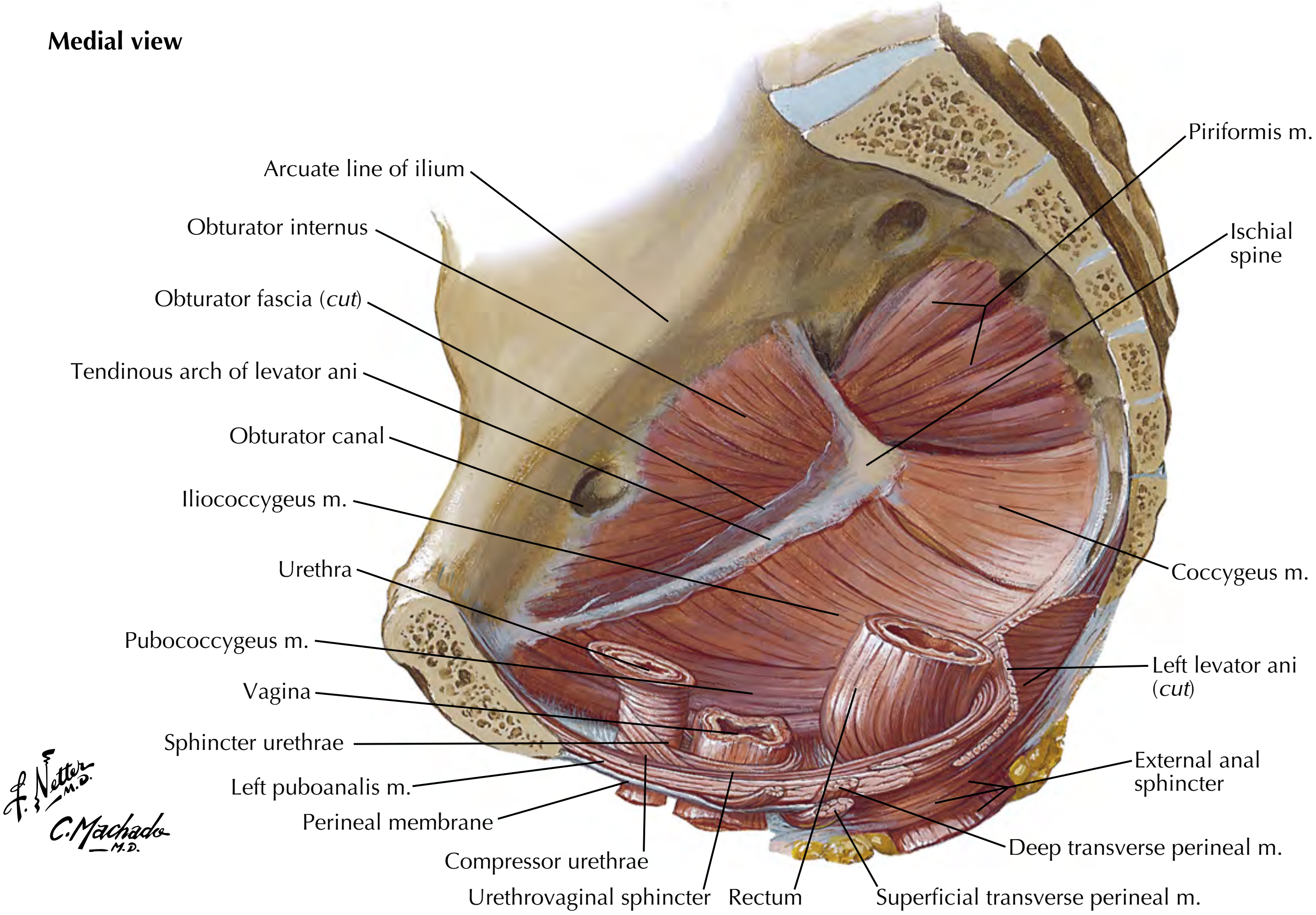
Lateral view

Supraspinous ligament
Posterior gluteal line
Anterior gluteal line
Posterior superior iliac spine
Median sacral crest
Posterior inferior iliac spine
Inferior gluteal line
Posterior sacroiliac ligament
Greater sciatic foramen
Sacrospinous ligament
Posterior sacrococcygeal ligaments
Lateral sacrococcygeal ligament
Sacrotuberous ligament
Ischial spine
Lesser sciatic foramen
Ischial tuberosity
Obturator membrane
Body of L4 vertebra
Intermediate zone
Outer lip
Iliac tubercle
Iliac crest
Gluteal surface of ala of ilium
Body of ilium
Anterior superior iliac spine
Anterior inferior iliac spine
Acetabulum
Acetabular labrum
Acetabular margin
Lunate surface
Acetabular notch
Transverse acetabular ligament
Superior pubic ramus
Pubic tubercle
Obturator crest
Obturator canal
Ischiopubic ramus

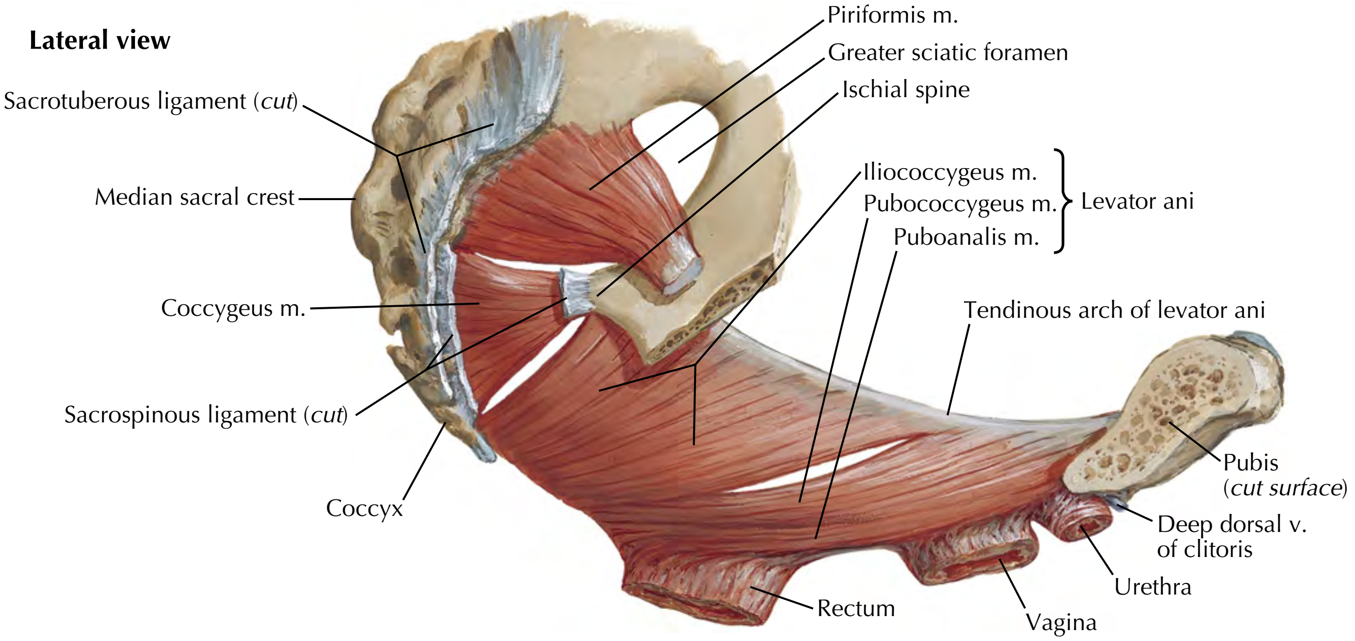
Pelvic Diaphragm: Female

See also Plate 364

Medial view


Arcuate line of ilium
Obturator internus
Obturator fascia (*cut*)
Tendinous arch of levator ani
Obturator canal
Iliococcygeus m.
Urethra
Pubococcygeus m.
Vagina
Sphincter urethrae
Left puboanalis m.
Perineal membrane
Compressor urethrae
Urethrovaginal sphincter
Rectum
Superficial transverse perineal m.
Deep transverse perineal m.
External anal sphincter
Left levator ani (*cut*)
Coccygeus m.
Ischial spine
Piriformis m.

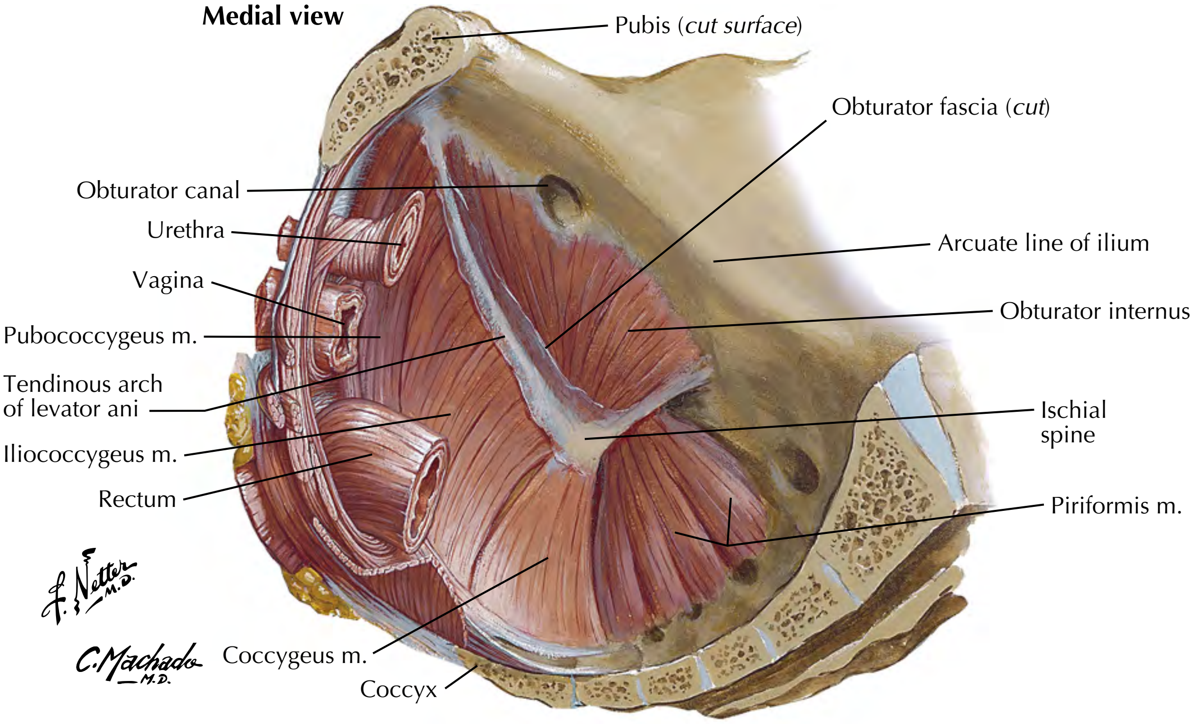
Lateral view


Sacrotuberous ligament (*cut*)
Median sacral crest
Coccygeus m.
Sacrospinous ligament (*cut*)
Coccyx
Piriformis m.
Greater sciatic foramen
Ischial spine
Iliococcygeus m.
Pubococcygeus m.
Puboanalis m.
Levator ani
Tendinous arch of levator ani
Pubis (*cut surface*)
Deep dorsal v. of clitoris
Urethra
Vagina
Rectum

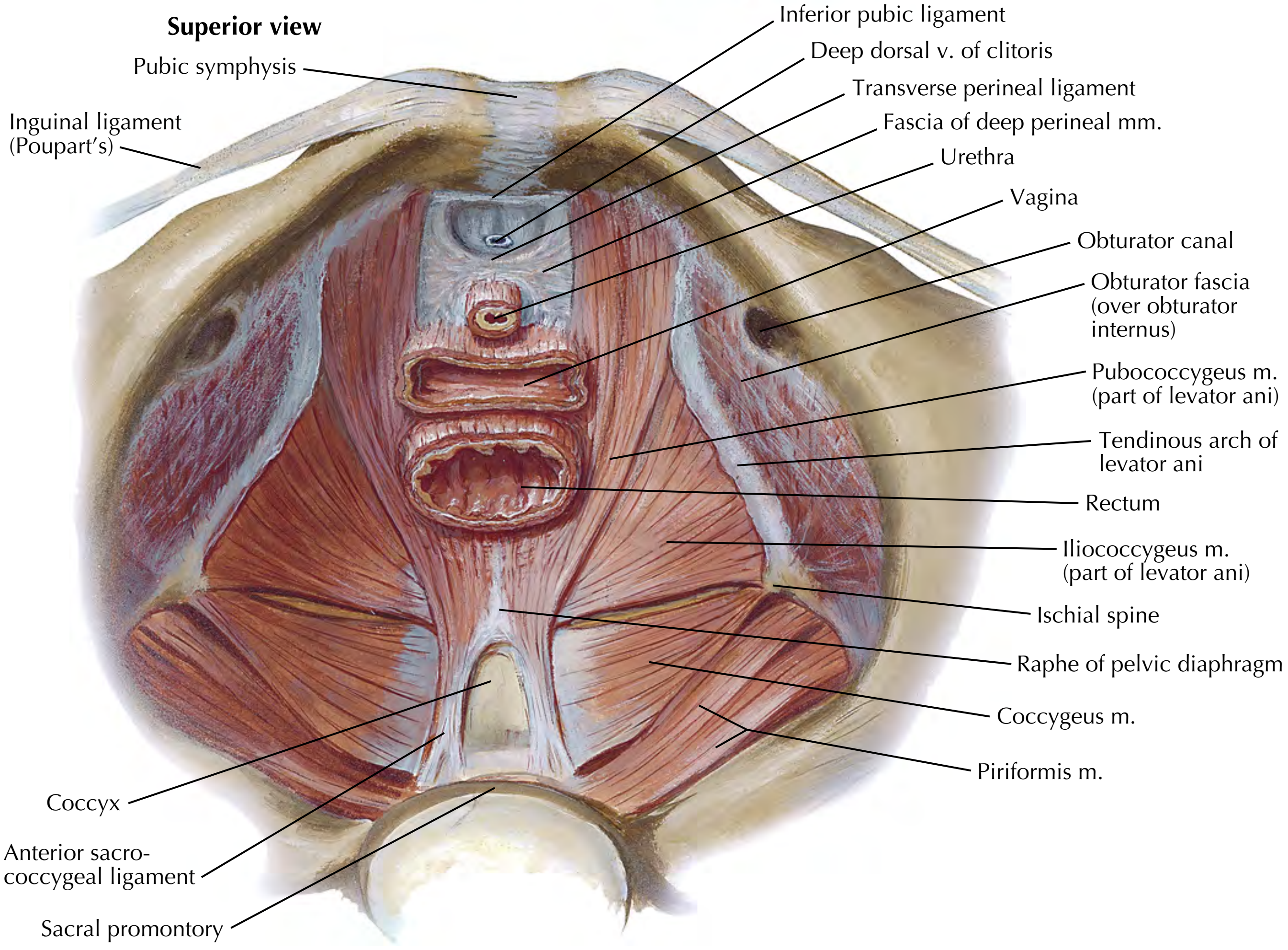
Pelvic Diaphragm (Female): Medial and Superior Views

See also **Plate 379**

Medial view

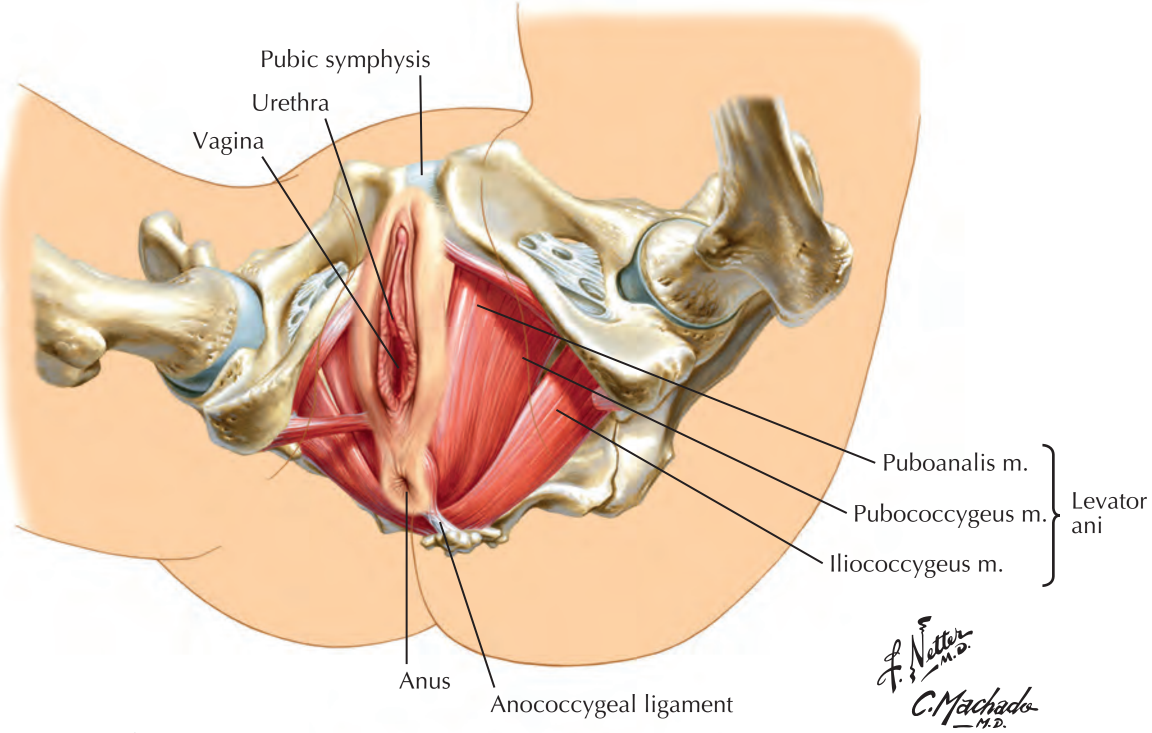

Pubis (*cut surface*)
Obturator fascia (*cut*)
Obturator canal
Urethra
Vagina
Arcuate line of ilium
Obturator internus
Pubococcygeus m.
Tendinous arch of levator ani
Ischial spine
Iliococcygeus m.
Rectum
Piriformis m.
F. Netter M.D.
C. Machado M.D.
Coccygeus m.
Coccyx

Superior view

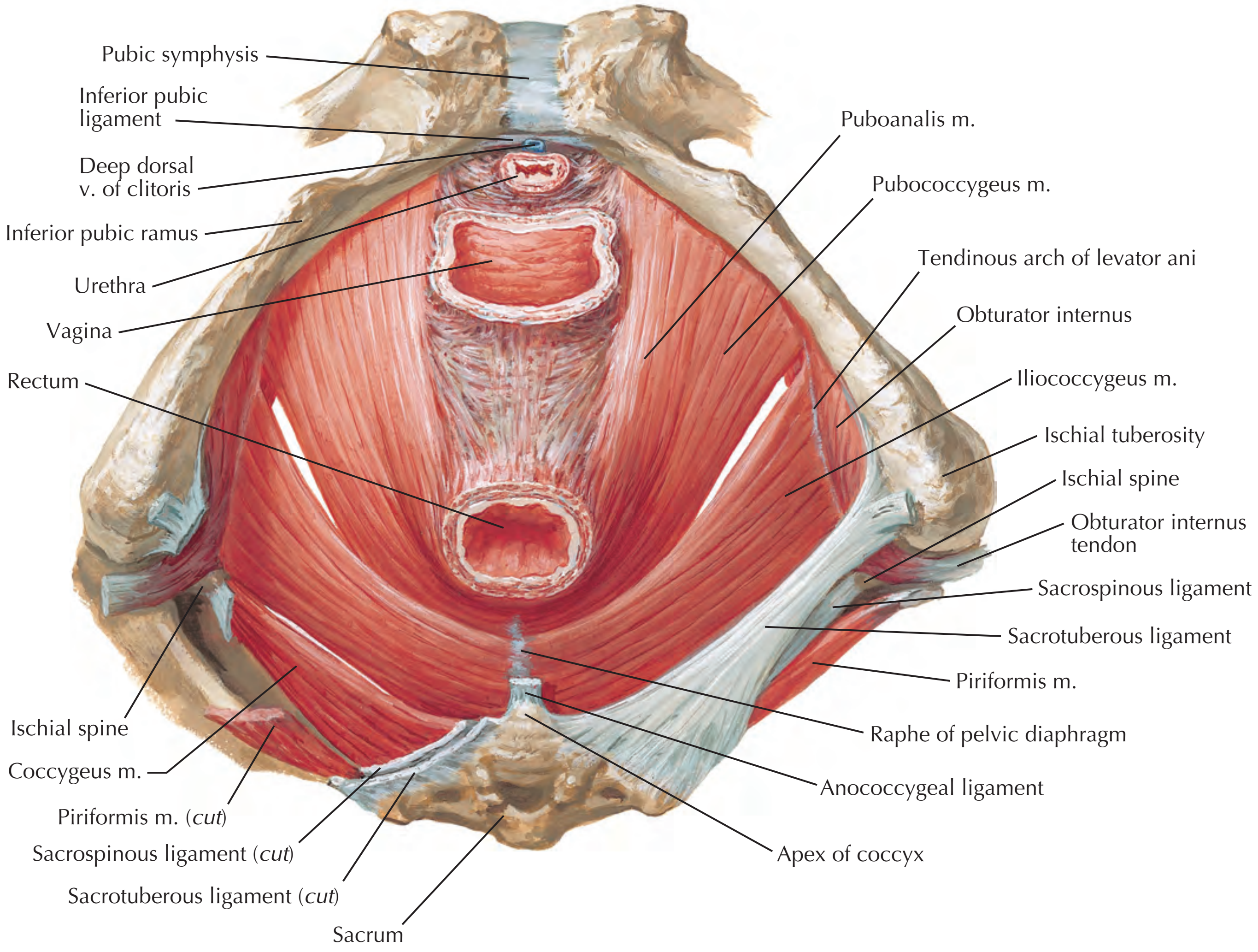

Inferior pubic ligament
Deep dorsal v. of clitoris
Pubic symphysis
Transverse perineal ligament
Fascia of deep perineal mm.
Inguinal ligament (Poupart's)
Urethra
Vagina
Obturator canal
Obturator fascia (over obturator internus)
Pubococcygeus m. (part of levator ani)
Tendinous arch of levator ani
Rectum
Iliococcygeus m. (part of levator ani)
Ischial spine
Raphe of pelvic diaphragm
Coccygeus m.
Piriformis m.
Coccyx
Anterior sacrococcygeal ligament
Sacral promontory

Pelvic Diaphragm (Female): Inferior Views

See also **Plate 380**


Pubic symphysis
Urethra
Vagina
Puboanalis m.
Pubococcygeus m.
Iliococcygeus m.
Levator ani
Anus
Anococcygeal ligament
F. Netter M.D.
C. Machado M.D.

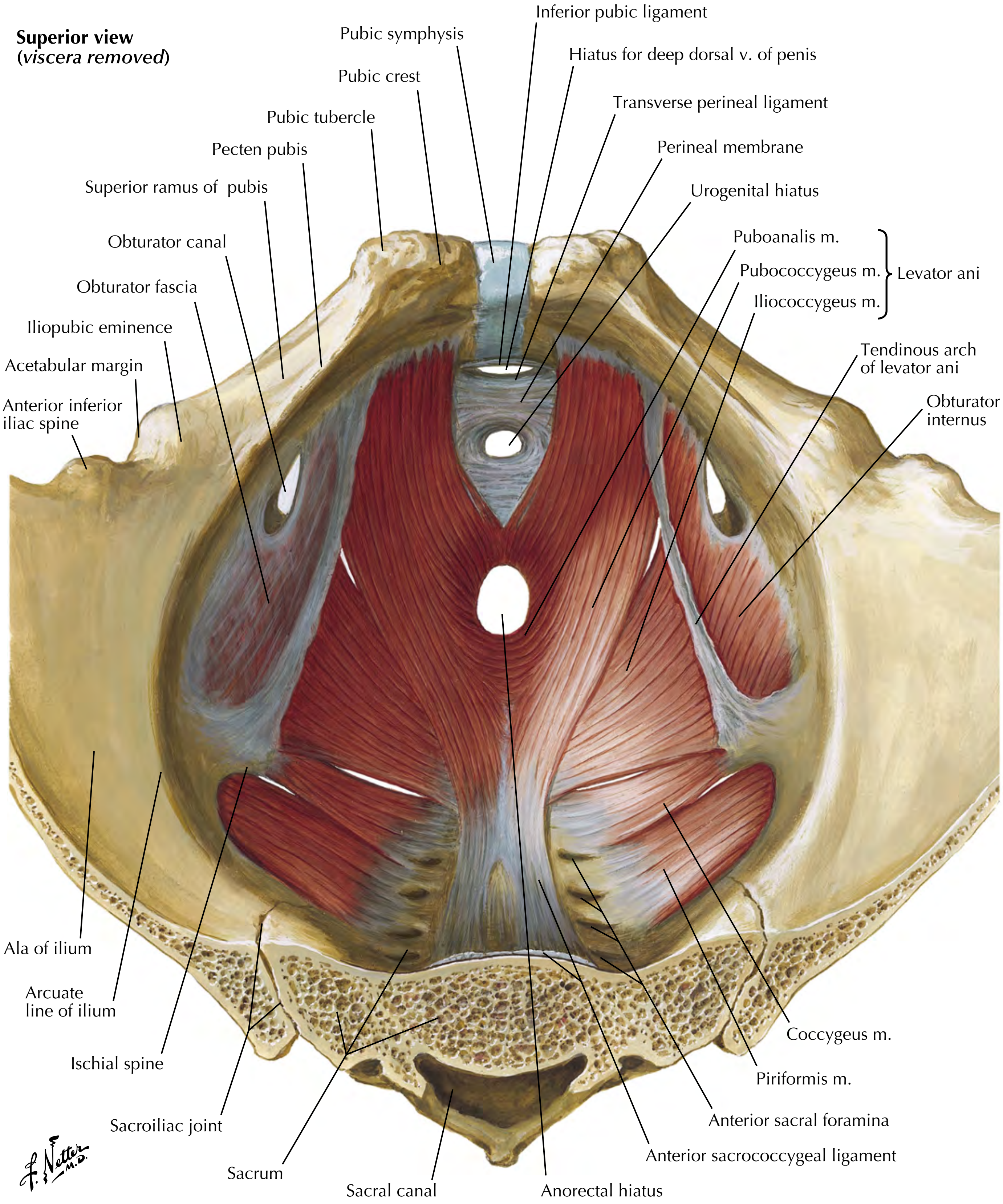
Inferior view


Pubic symphysis
Inferior pubic ligament
Deep dorsal v. of clitoris
Inferior pubic ramus
Urethra
Vagina
Rectum
Ischial spine
Coccygeus m.
Piriformis m. (*cut*)
Sacrospinous ligament (*cut*)
Sacrotuberous ligament (*cut*)
Sacrum
Puboanalis m.
Pubococcygeus m.
Tendinous arch of levator ani
Obturator internus
Iliococcygeus m.
Ischial tuberosity
Ischial spine
Obturator internus tendon
Sacrospinous ligament
Sacrotuberous ligament
Piriformis m.
Raphe of pelvic diaphragm
Anococcygeal ligament
Apex of coccyx

Pelvic Diaphragm (Male): Superior View

See also **Plate 362**

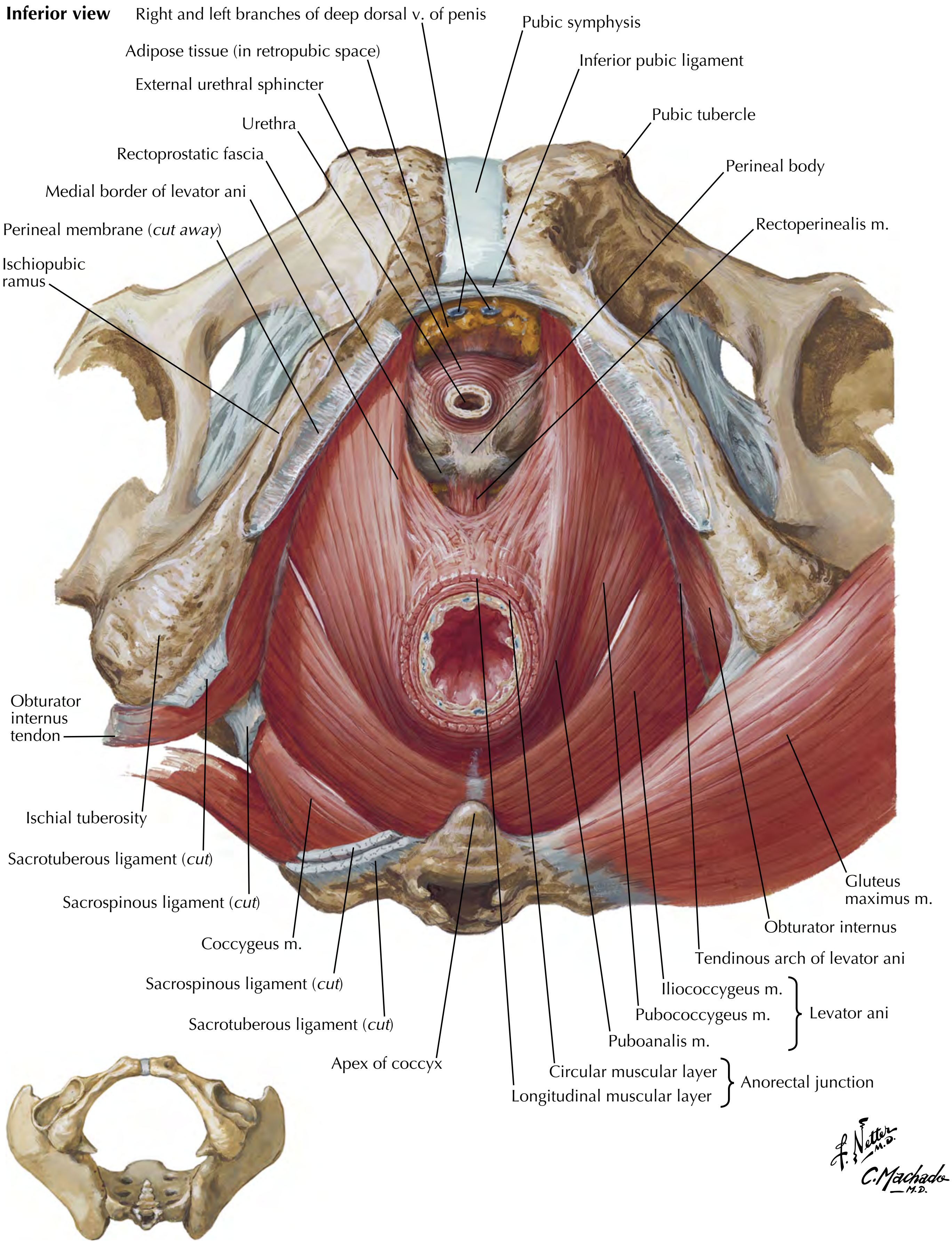
Superior view
(*viscera removed*)



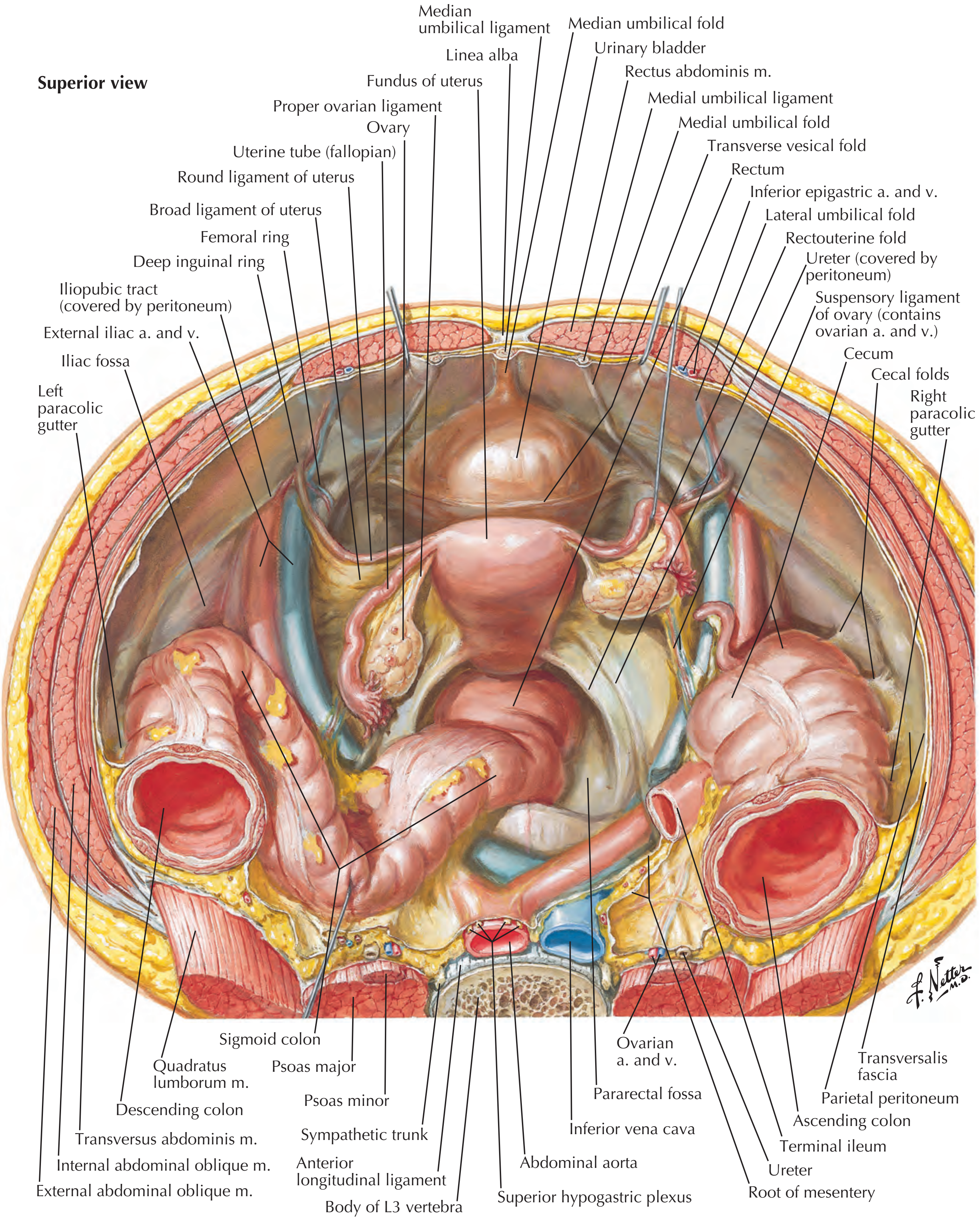
Inferior pubic ligament
Pubic symphysis
Hiatus for deep dorsal v. of penis
Pubic crest
Transverse perineal ligament
Pubic tubercle
Pecten pubis
Perineal membrane
Superior ramus of pubis
Urogenital hiatus
Obturator canal
Puboanalis m.
Pubococcygeus m.
Iliococcygeus m.
Levator ani
Obturator fascia
Iliopubic eminence
Acetabular margin
Tendinous arch of levator ani
Anterior inferior iliac spine
Obturator internus
Ala of ilium
Arcuate line of ilium
Coccygeus m.
Ischial spine
Piriformis m.
Anterior sacral foramina
Sacroiliac joint
Anterior sacrococcygeal ligament
Sacrum
Sacral canal
Anorectal hiatus
F. Netter M.D.

Pelvic Diaphragm (Male): Inferior View

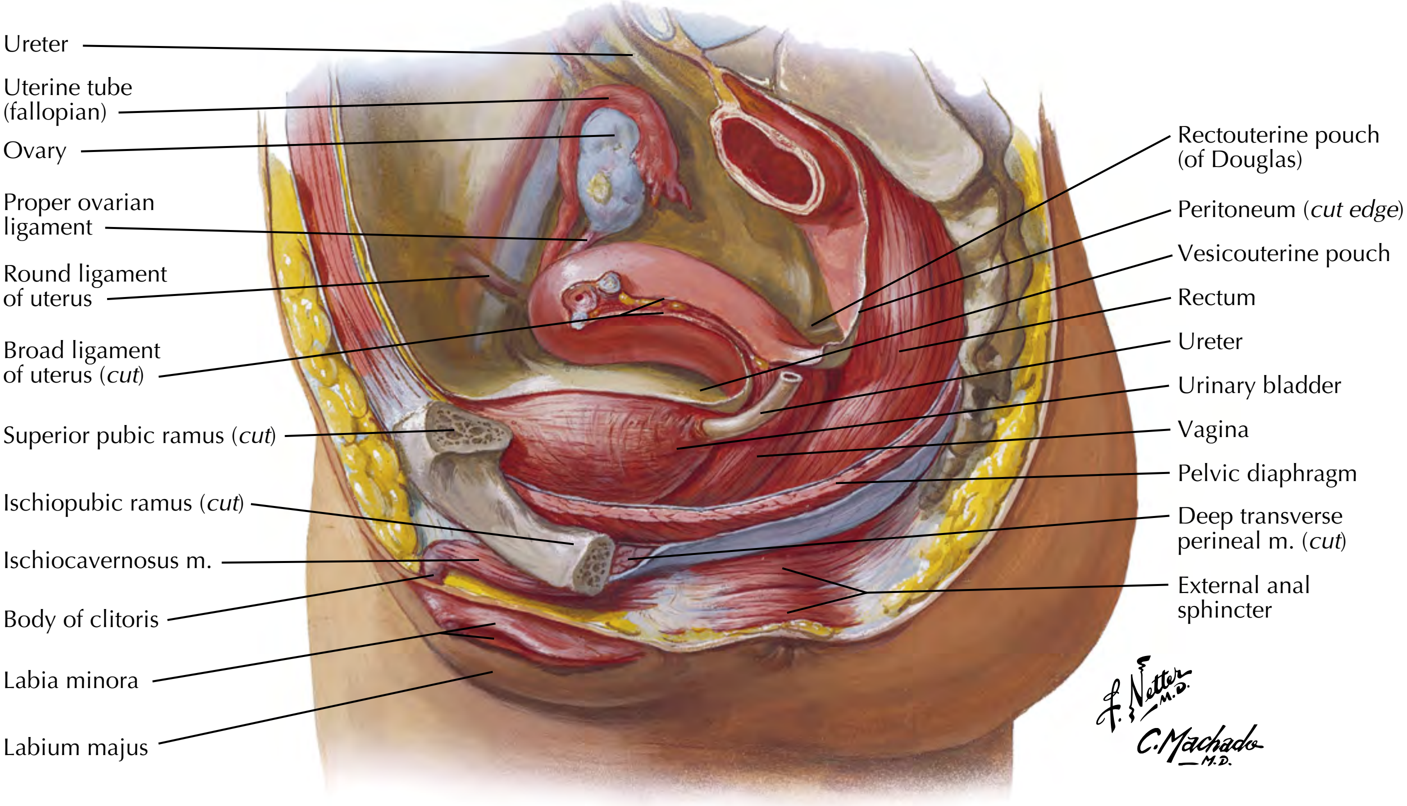
See also **Plate 384**


Inferior view
Right and left branches of deep dorsal v. of penis
Adipose tissue (in retropubic space)
External urethral sphincter
Urethra
Rectoprostatic fascia
Medial border of levator ani
Perineal membrane (*cut away*)
Ischiopubic ramus
Pubic symphysis
Inferior pubic ligament
Pubic tubercle
Perineal body
Rectoperinealis m.
Obturator internus tendon
Ischial tuberosity
Sacrotuberous ligament (*cut*)
Sacrospinous ligament (*cut*)
Coccygeus m.
Sacrospinous ligament (*cut*)
Sacrotuberous ligament (*cut*)
Apex of coccyx
Gluteus maximus m.
Obturator internus
Tendinous arch of levator ani
Iliococcygeus m.
Pubococcygeus m.
Puboanalis m.
Levator ani
Circular muscular layer
Longitudinal muscular layer
Anorectal junction
F. Netter M.D.
C. Machado M.D.

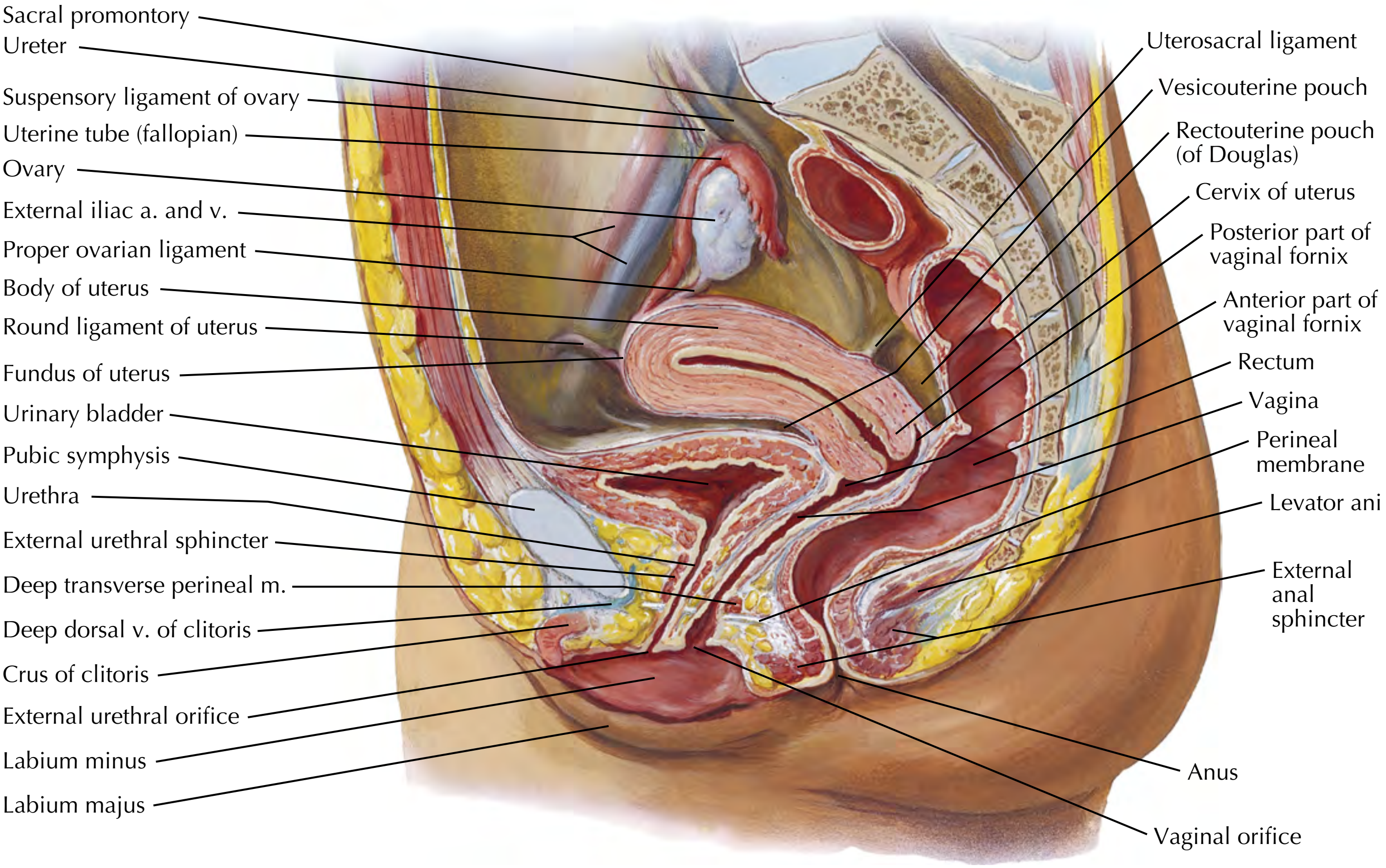
Superior view


Median umbilical ligament
Median umbilical fold
Linea alba
Urinary bladder
Fundus of uterus
Rectus abdominis m.
Proper ovarian ligament
Medial umbilical ligament
Ovary
Medial umbilical fold
Uterine tube (fallopian)
Transverse vesical fold
Round ligament of uterus
Rectum
Inferior epigastric a. and v.
Broad ligament of uterus
Lateral umbilical fold
Femoral ring
Rectouterine fold
Deep inguinal ring
Ureter (covered by peritoneum)
Iliopubic tract (covered by peritoneum)
Suspensory ligament of ovary (contains ovarian a. and v.)
External iliac a. and v.
Cecum
Iliac fossa
Cecal folds
Left paracolic gutter
Right paracolic gutter
Sigmoid colon
Quadratus lumborum m.
Psoas major
Ovarian a. and v.
Transversalis fascia
Psoas minor
Pararectal fossa
Parietal peritoneum
Descending colon
Ascending colon
Sympathetic trunk
Inferior vena cava
Transversus abdominis m.
Terminal ileum
Internal abdominal oblique m.
Anterior longitudinal ligament
Abdominal aorta
Ureter
External abdominal oblique m.
Body of L3 vertebra
Superior hypogastric plexus
Root of mesentery

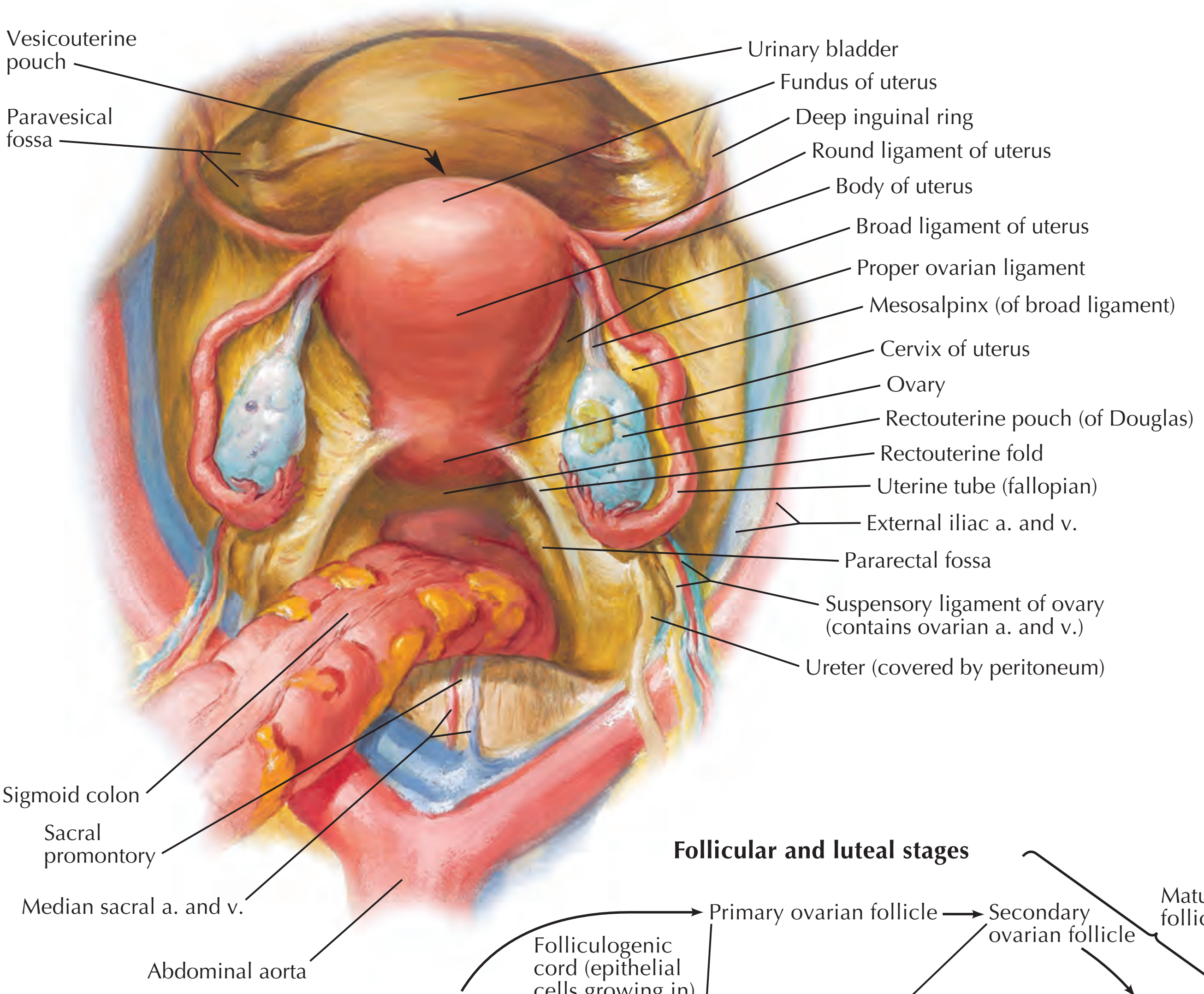
Paramedian (sagittal) dissection


Ureter
Uterine tube (fallopian)
Ovary
Proper ovarian ligament
Round ligament of uterus
Broad ligament of uterus (*cut*)
Superior pubic ramus (*cut*)
Ischiopubic ramus (*cut*)
Ischiocavernosus m.
Body of clitoris
Labia minora
Labium majus
Rectouterine pouch (of Douglas)
Peritoneum (*cut edge*)
Vesicouterine pouch
Rectum
Ureter
Urinary bladder
Vagina
Pelvic diaphragm
Deep transverse perineal m. (*cut*)
External anal sphincter
F. Netter M.D.
C.Machado M.D.

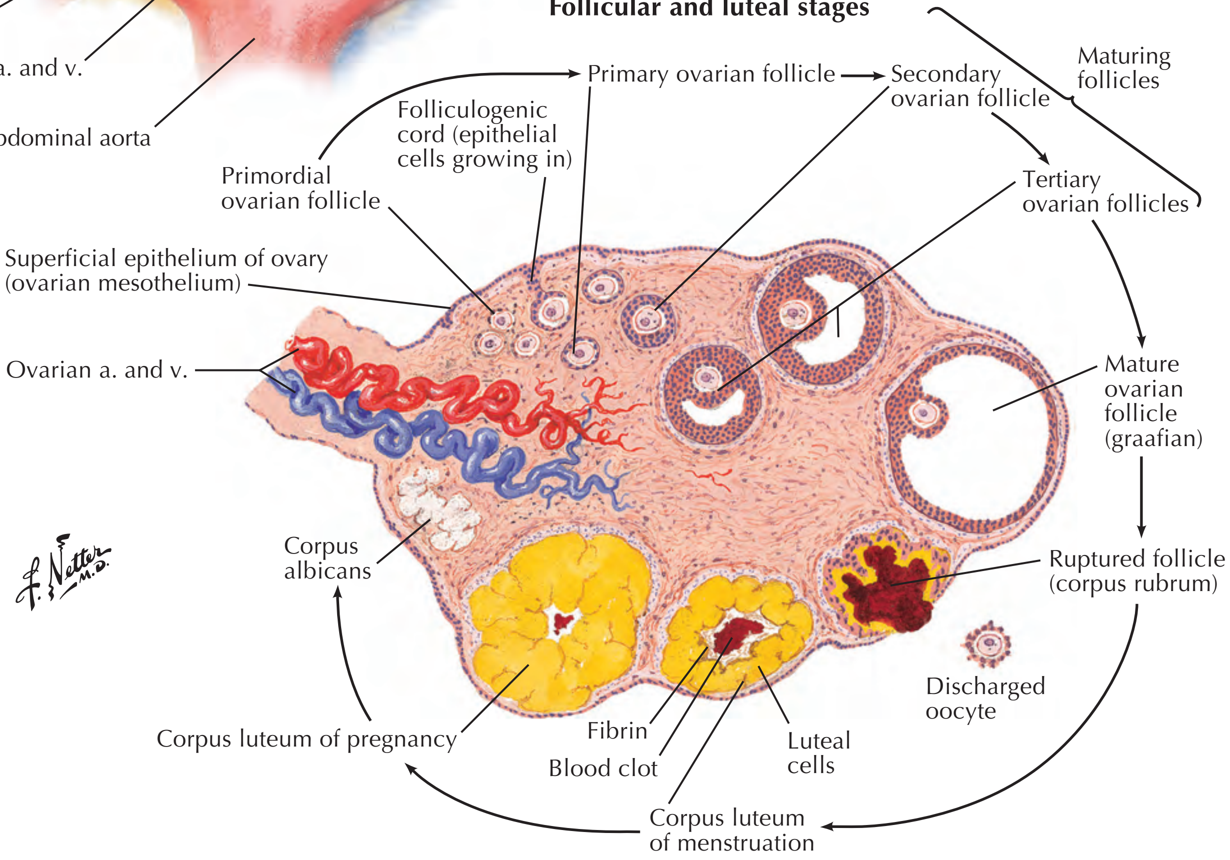
Median (sagittal) section


Sacral promontory
Ureter
Suspensory ligament of ovary
Uterine tube (fallopian)
Ovary
External iliac a. and v.
Proper ovarian ligament
Body of uterus
Round ligament of uterus
Fundus of uterus
Urinary bladder
Pubic symphysis
Urethra
External urethral sphincter
Deep transverse perineal m.
Deep dorsal v. of clitoris
Crus of clitoris
External urethral orifice
Labium minus
Labium majus
Uterosacral ligament
Vesicouterine pouch
Rectouterine pouch (of Douglas)
Cervix of uterus
Posterior part of vaginal fornix
Anterior part of vaginal fornix
Rectum
Vagina
Perineal membrane
Levator ani
External anal sphincter
Anus
Vaginal orifice

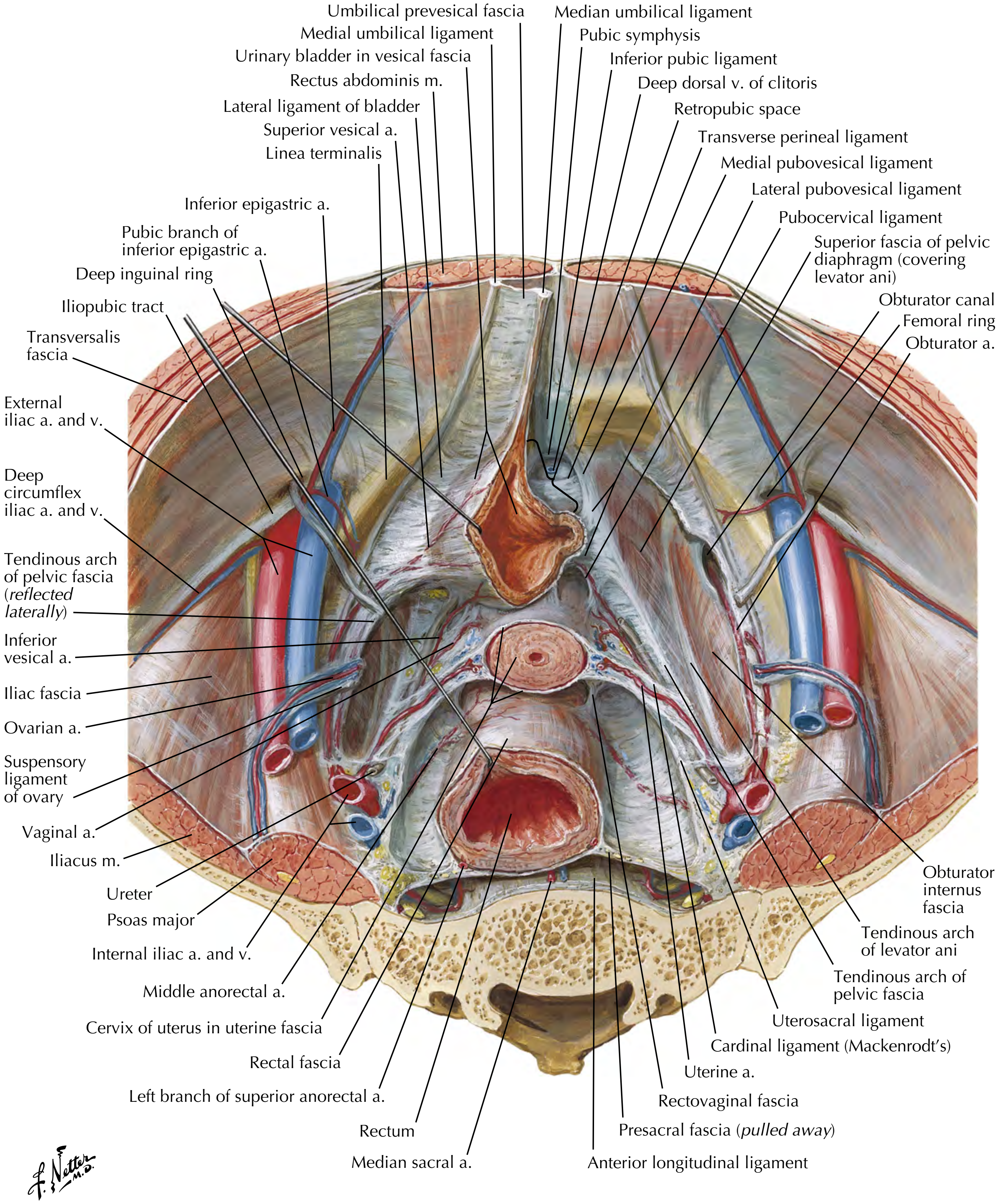
Superior view with peritoneum intact


Vesicouterine pouch
Paravesical fossa
Urinary bladder
Fundus of uterus
Deep inguinal ring
Round ligament of uterus
Body of uterus
Broad ligament of uterus
Proper ovarian ligament
Mesosalpinx (of broad ligament)
Cervix of uterus
Ovary
Rectouterine pouch (of Douglas)
Rectouterine fold
Uterine tube (fallopian)
External iliac a. and v.
Pararectal fossa
Suspensory ligament of ovary (contains ovarian a. and v.)
Ureter (covered by peritoneum)
Sigmoid colon
Sacral promontory
Median sacral a. and v.
Abdominal aorta

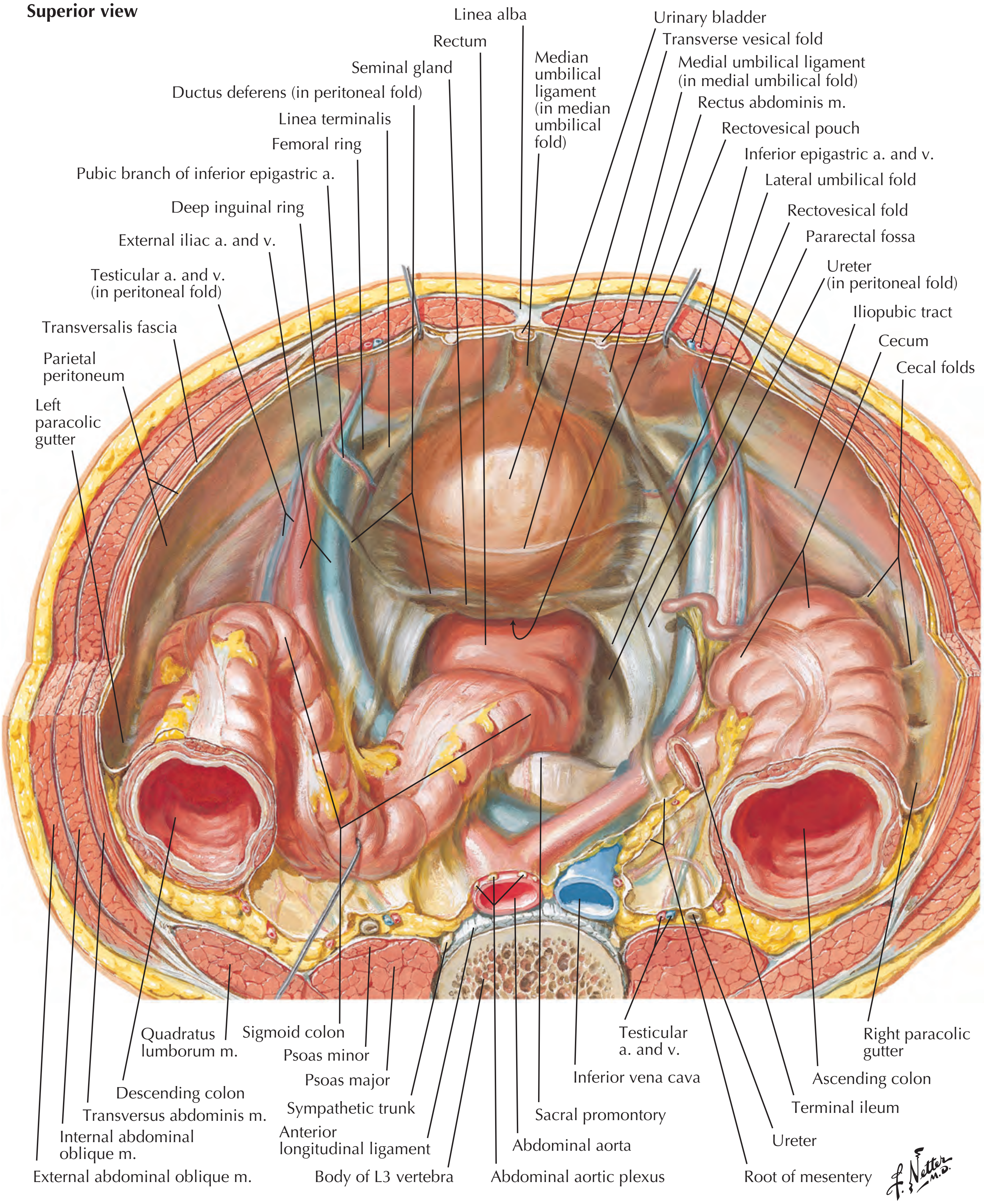
Follicular and luteal stages


Primary ovarian follicle
Secondary ovarian follicle
Maturing follicles
Folliculogenic cord (epithelial cells growing in)
Primordial ovarian follicle
Tertiary ovarian follicles
Superficial epithelium of ovary (ovarian mesothelium)
Ovarian a. and v.
Mature ovarian follicle (graafian)
Corpus albicans
Ruptured follicle (corpus rubrum)
Discharged oocyte
Corpus luteum of pregnancy
Fibrin
Blood clot
Luteal cells
Corpus luteum of menstruation

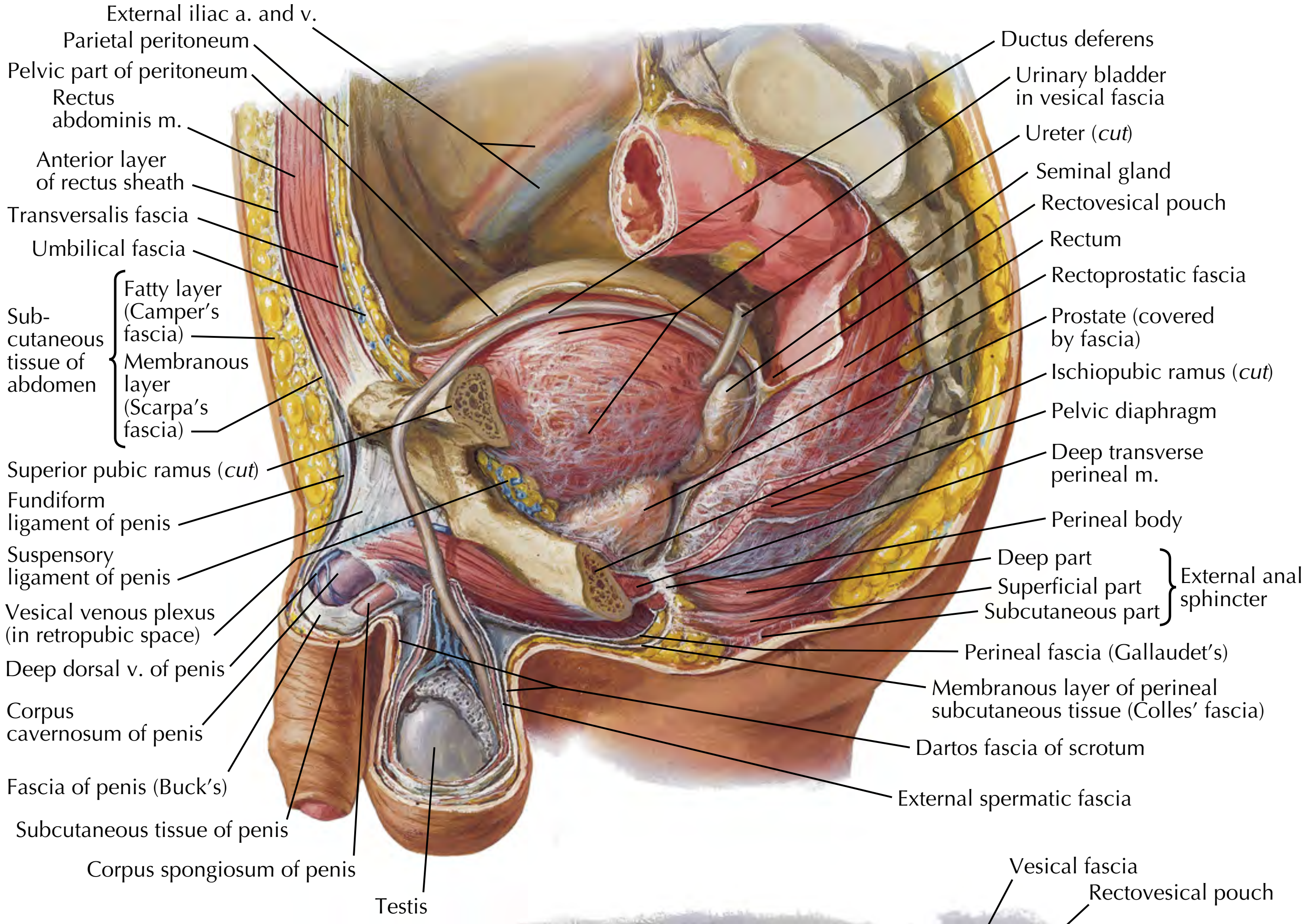
Female: superior view (peritoneum and loose connective tissue removed)


Umbilical prevesical fascia
Medial umbilical ligament
Urinary bladder in vesical fascia
Rectus abdominis m.
Lateral ligament of bladder
Superior vesical a.
Linea terminalis
Inferior epigastric a.
Pubic branch of inferior epigastric a.
Deep inguinal ring
Iliopubic tract
Transversalis fascia
External iliac a. and v.
Deep circumflex iliac a. and v.
Tendinous arch of pelvic fascia (*reflected laterally*)
Inferior vesical a.
Iliac fascia
Ovarian a.
Suspensory ligament of ovary
Vaginal a.
Iliacus m.
Ureter
Psoas major
Internal iliac a. and v.
Middle anorectal a.
Cervix of uterus in uterine fascia
Rectal fascia
Left branch of superior anorectal a.
Rectum
Median sacral a.
Median umbilical ligament
Pubic symphysis
Inferior pubic ligament
Deep dorsal v. of clitoris
Retropubic space
Transverse perineal ligament
Medial pubovesical ligament
Lateral pubovesical ligament
Pubocervical ligament
Superior fascia of pelvic diaphragm (covering levator ani)
Obturator canal
Femoral ring
Obturator a.
Obturator internus fascia
Tendinous arch of levator ani
Tendinous arch of pelvic fascia
Uterosacral ligament
Cardinal ligament (Mackenrodt's)
Uterine a.
Rectovaginal fascia
Presacral fascia (*pulled away*)
Anterior longitudinal ligament
F. Netter M.D.

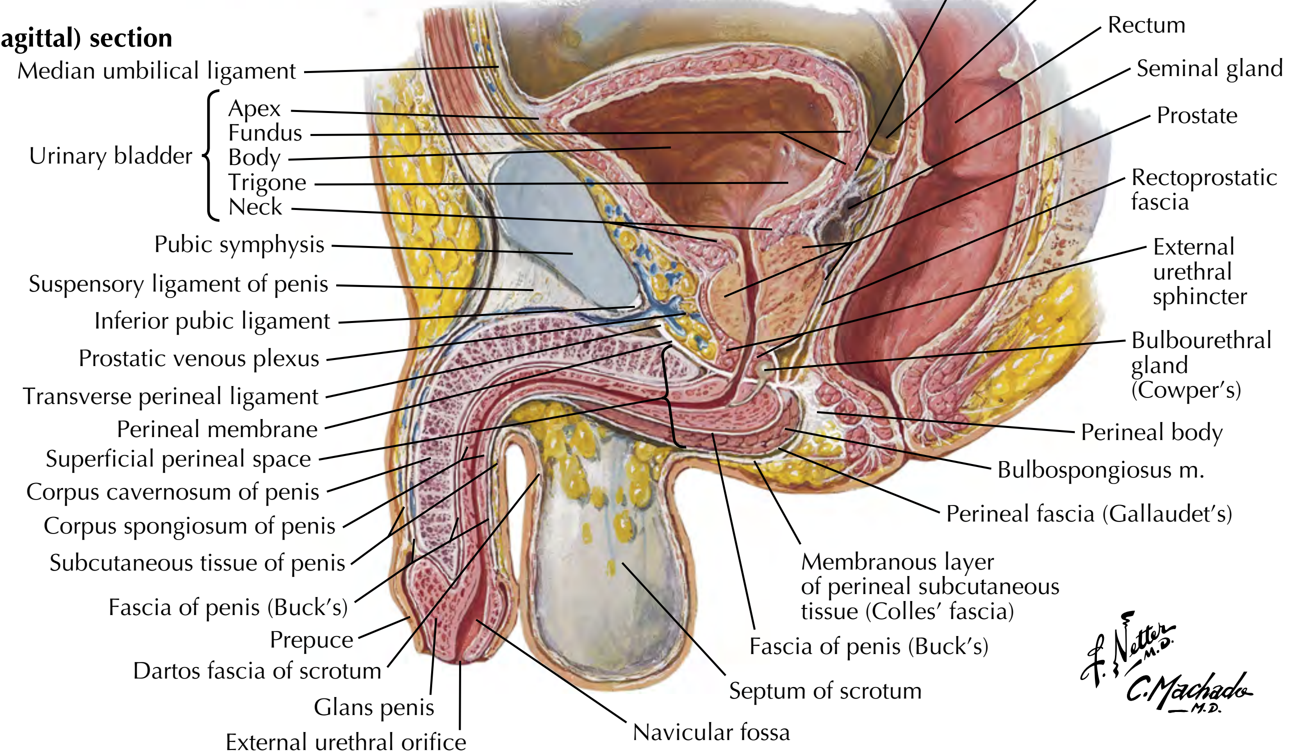
Superior view


Linea alba
Rectum
Seminal gland
Ductus deferens (in peritoneal fold)
Linea terminalis
Femoral ring
Pubic branch of inferior epigastric a.
Deep inguinal ring
External iliac a. and v.
Testicular a. and v. (in peritoneal fold)
Transversalis fascia
Parietal peritoneum
Left paracolic gutter
Median umbilical ligament (in median umbilical fold)
Urinary bladder
Transverse vesical fold
Medial umbilical ligament (in medial umbilical fold)
Rectus abdominis m.
Rectovesical pouch
Inferior epigastric a. and v.
Lateral umbilical fold
Rectovesical fold
Pararectal fossa
Ureter (in peritoneal fold)
Iliopubic tract
Cecum
Cecal folds
Quadratus lumborum m.
Sigmoid colon
Psoas minor
Psoas major
Descending colon
Transversus abdominis m.
Sympathetic trunk
Internal abdominal oblique m.
Anterior longitudinal ligament
External abdominal oblique m.
Body of L3 vertebra
Testicular a. and v.
Inferior vena cava
Sacral promontory
Abdominal aorta
Abdominal aortic plexus
Right paracolic gutter
Ascending colon
Terminal ileum
Ureter
Root of mesentery

Parasagittal view

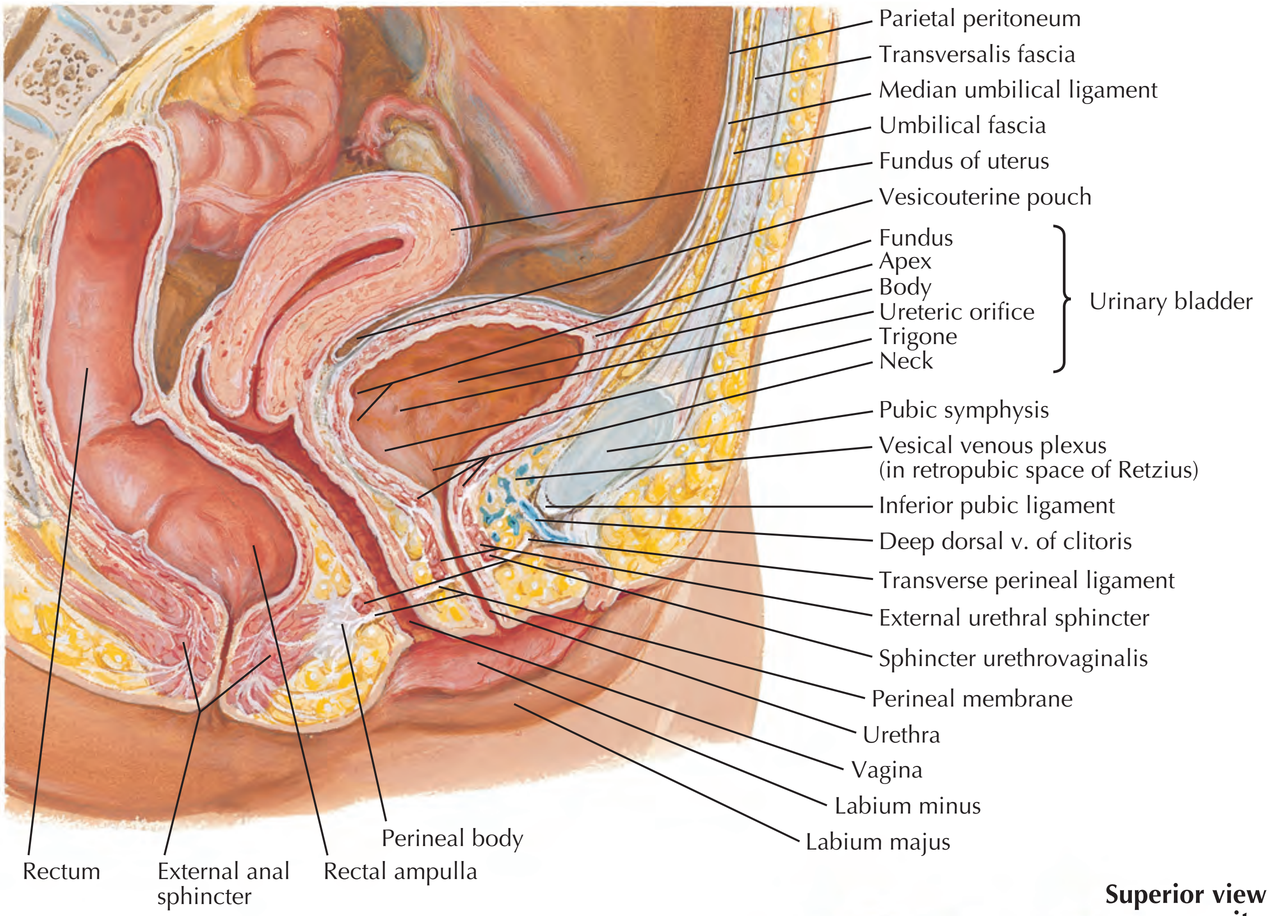

External iliac a. and v.
Parietal peritoneum
Pelvic part of peritoneum
Rectus abdominis m.
Anterior layer of rectus sheath
Transversalis fascia
Umbilical fascia
Sub-cutaneous tissue of abdomen
Fatty layer (Camper's fascia)
Membranous layer (Scarpa's fascia)
Superior pubic ramus (*cut*)
Fundiform ligament of penis
Suspensory ligament of penis
Vesical venous plexus (in retropubic space)
Deep dorsal v. of penis
Corpus cavernosum of penis
Fascia of penis (Buck's)
Subcutaneous tissue of penis
Corpus spongiosum of penis
Testis
Ductus deferens
Urinary bladder in vesical fascia
Ureter (*cut*)
Seminal gland
Rectovesical pouch
Rectum
Rectoprostatic fascia
Prostate (covered by fascia)
Ischiopubic ramus (*cut*)
Pelvic diaphragm
Deep transverse perineal m.
Perineal body
Deep part
Superficial part
Subcutaneous part
External anal sphincter
Perineal fascia (Gallaudet's)
Membranous layer of perineal subcutaneous tissue (Colles' fascia)
Dartos fascia of scrotum
External spermatic fascia

Median (sagittal) section


Vesical fascia
Rectovesical pouch
Rectum
Seminal gland
Prostate
Rectoprostatic fascia
External urethral sphincter
Bulbourethral gland (Cowper's)
Perineal body
Bulbospongiosus m.
Perineal fascia (Gallaudet's)
Membranous layer of perineal subcutaneous tissue (Colles' fascia)
Fascia of penis (Buck's)
Septum of scrotum
Navicular fossa
Median umbilical ligament
Urinary bladder
Apex
Fundus
Body
Trigone
Neck
Pubic symphysis
Suspensory ligament of penis
Inferior pubic ligament
Prostatic venous plexus
Transverse perineal ligament
Perineal membrane
Superficial perineal space
Corpus cavernosum of penis
Corpus spongiosum of penis
Subcutaneous tissue of penis
Fascia of penis (Buck's)
Prepuce
Dartos fascia of scrotum
Glans penis
External urethral orifice

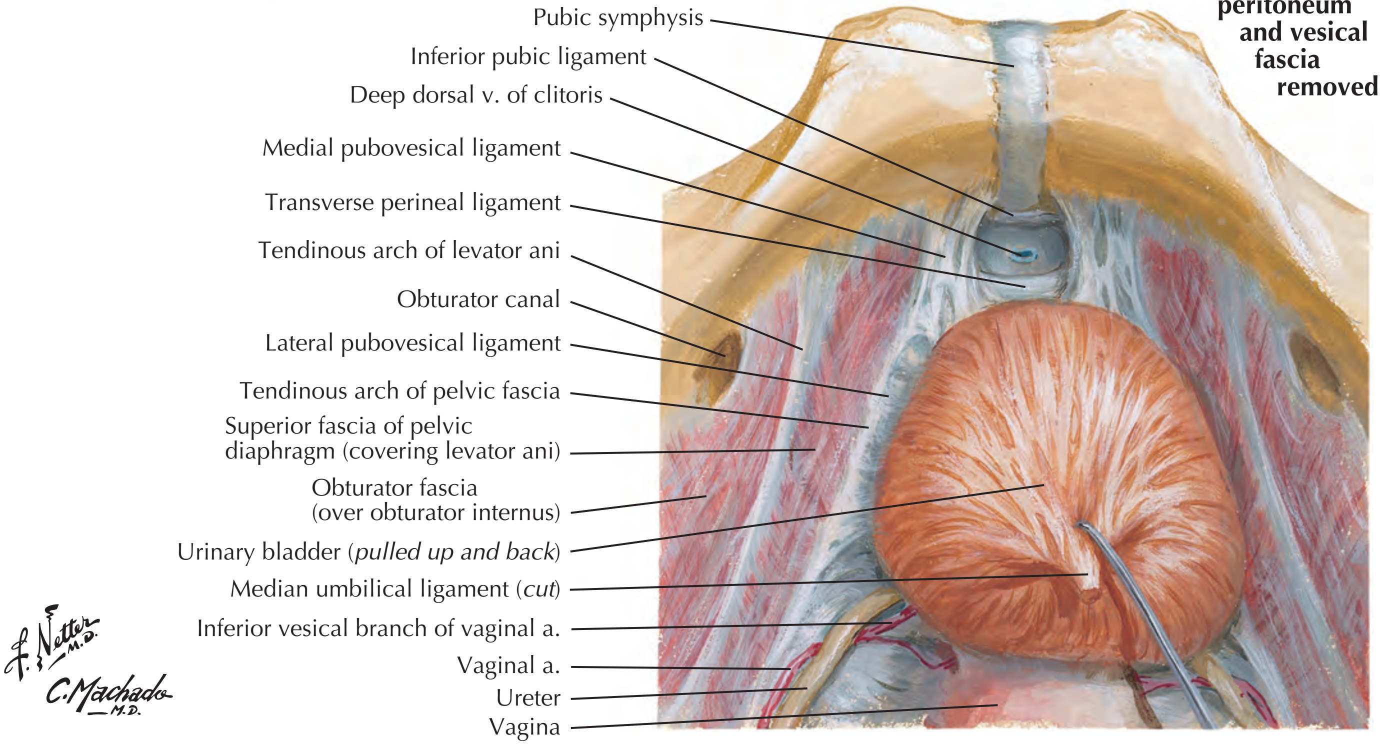
Urinary Bladder: Orientation and Supports

Female: median section



Parietal peritoneum
Transversalis fascia
Median umbilical ligament
Umbilical fascia
Fundus of uterus
Vesicouterine pouch
Fundus
Apex
Body
Ureteric orifice
Trigone
Neck
Urinary bladder
Pubic symphysis
Vesical venous plexus (in retropubic space of Retzius)
Inferior pubic ligament
Deep dorsal v. of clitoris
Transverse perineal ligament
External urethral sphincter
Sphincter urethrovaginalis
Perineal membrane
Urethra
Vagina
Labium minus
Labium majus
Perineal body
Rectum
External anal sphincter
Rectal ampulla

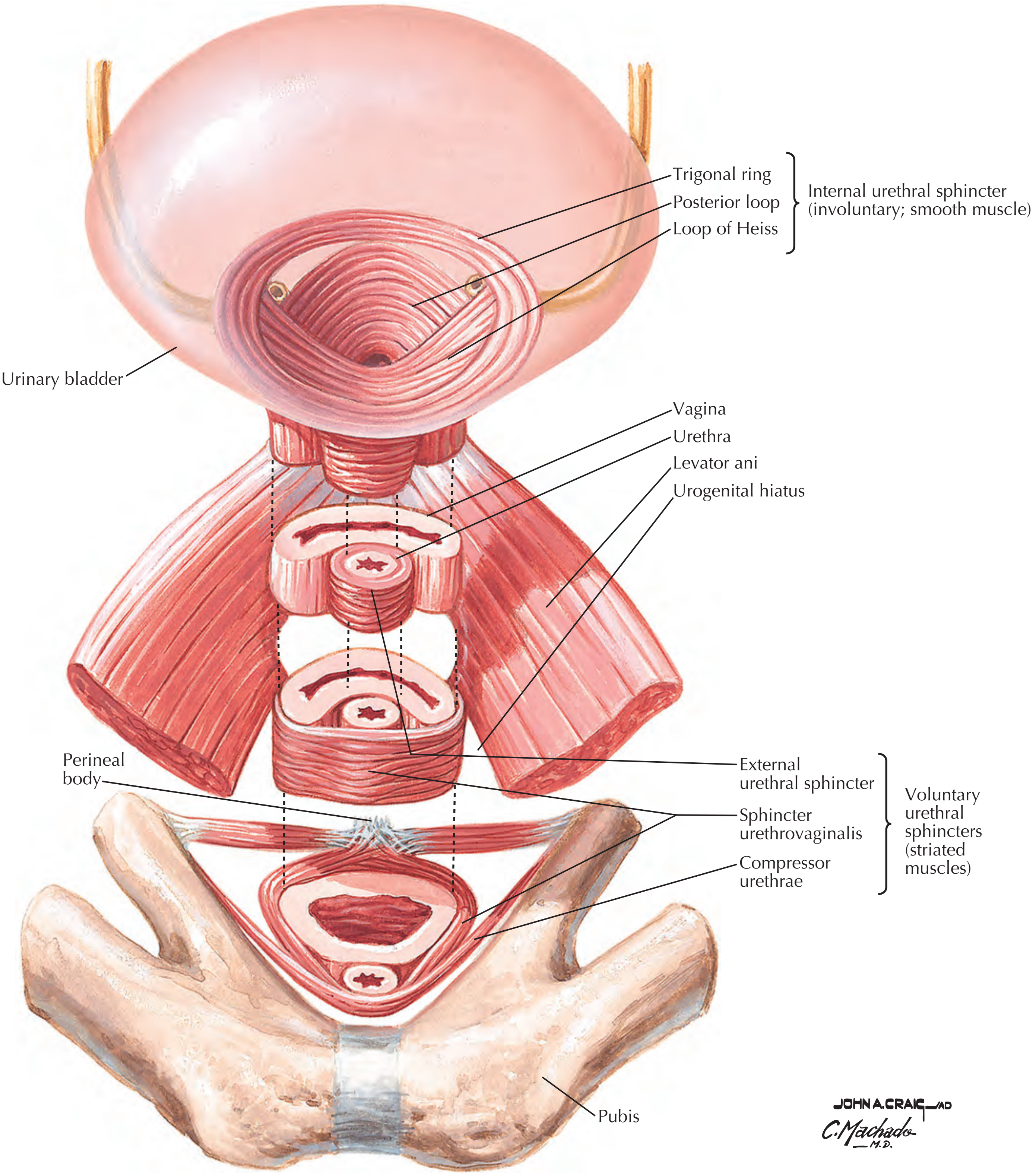
Superior view with peritoneum and vesical fascia removed



Pubic symphysis
Inferior pubic ligament
Deep dorsal v. of clitoris
Medial pubovesical ligament
Transverse perineal ligament
Tendinous arch of levator ani
Obturator canal
Lateral pubovesical ligament
Tendinous arch of pelvic fascia
Superior fascia of pelvic diaphragm (covering levator ani)
Obturator fascia (over obturator internus)
Urinary bladder (*pulled up and back*)
Median umbilical ligament (*cut*)
Inferior vesical branch of vaginal a.
Vaginal a.
Ureter
Vagina
F. Netter M.D.
C. Machado M.D.

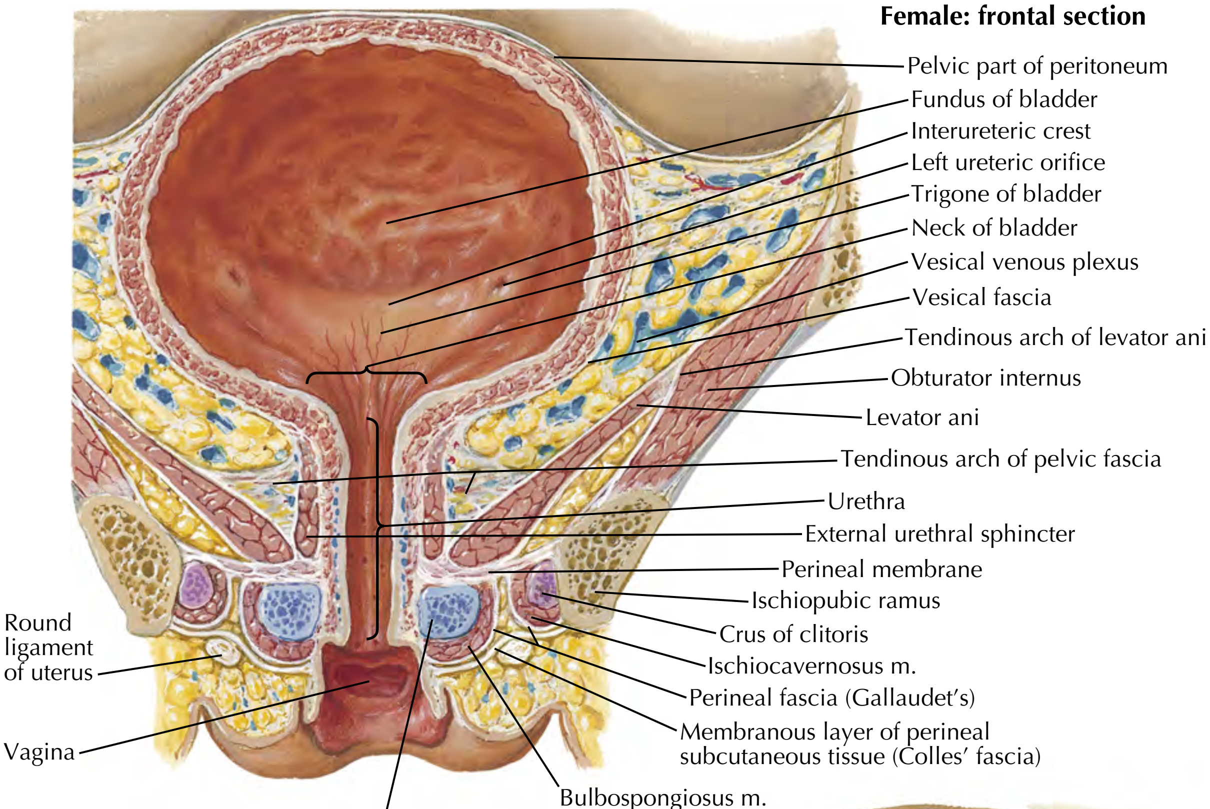
Female Urethral Sphincters

See also Plates 371, 379


Trigonal ring
Posterior loop
Loop of Heiss
Internal urethral sphincter (involuntary; smooth muscle)
Urinary bladder
Vagina
Urethra
Levator ani
Urogenital hiatus
Perineal body
External urethral sphincter
Sphincter urethrovaginalis
Compressor urethrae
Voluntary urethral sphincters (striated muscles)
Pubis
JOHN A.CRAIG AD
C.Machado M.D.

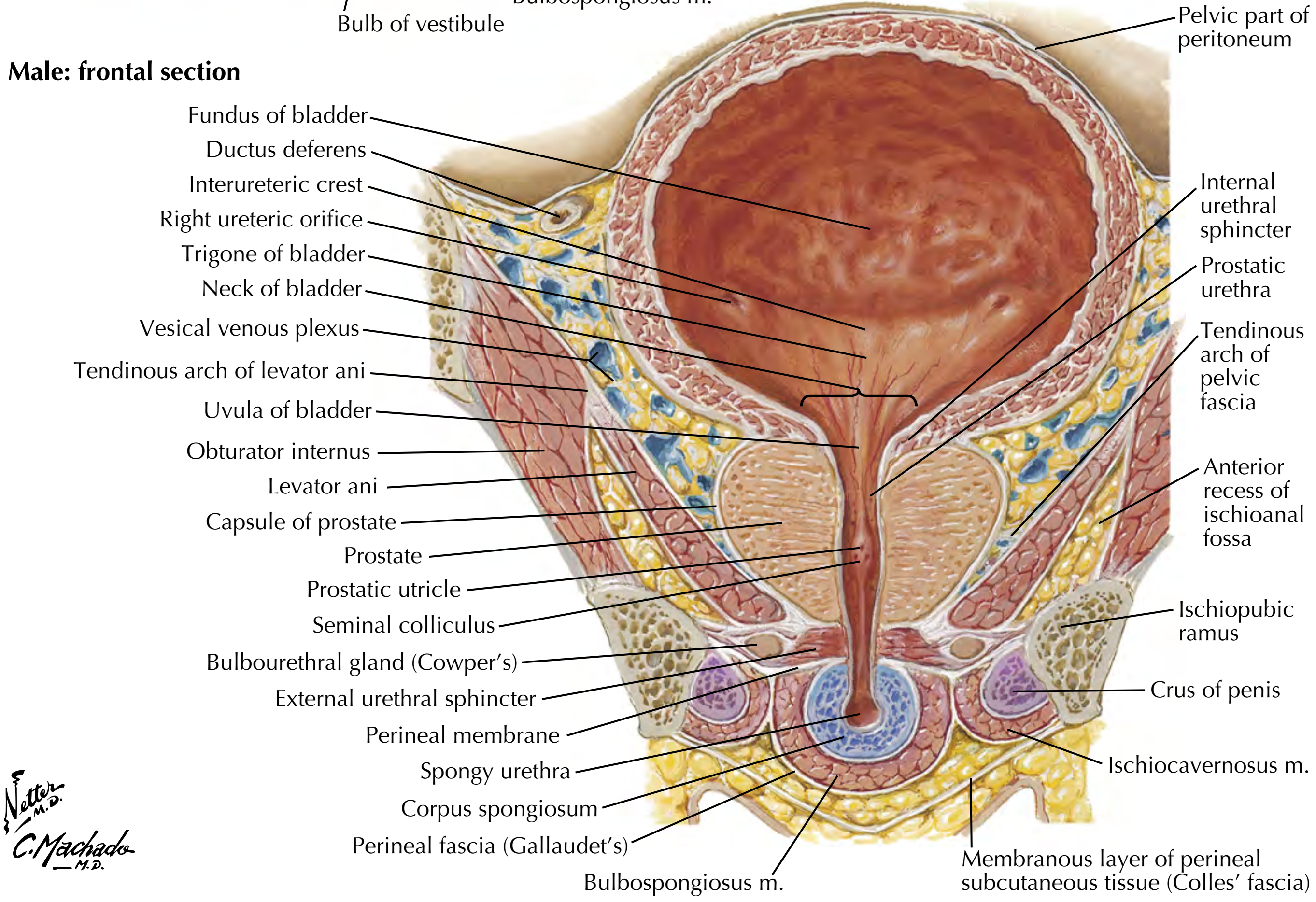
Urinary Bladder: Female and Male

See also **Plates 364, 368, 405, BP 85, BP 86**



Female: frontal section

Pelvic part of peritoneum
Fundus of bladder
Interureteric crest
Left ureteric orifice
Trigone of bladder
Neck of bladder
Vesical venous plexus
Vesical fascia
Tendinous arch of levator ani
Obturator internus
Levator ani
Tendinous arch of pelvic fascia
Urethra
External urethral sphincter
Perineal membrane
Ischiopubic ramus
Crus of clitoris
Ischiocavernosus m.
Perineal fascia (Gallaudet's)
Membranous layer of perineal subcutaneous tissue (Colles' fascia)
Round ligament of uterus
Vagina
Bulbospongiosus m.
Bulb of vestibule

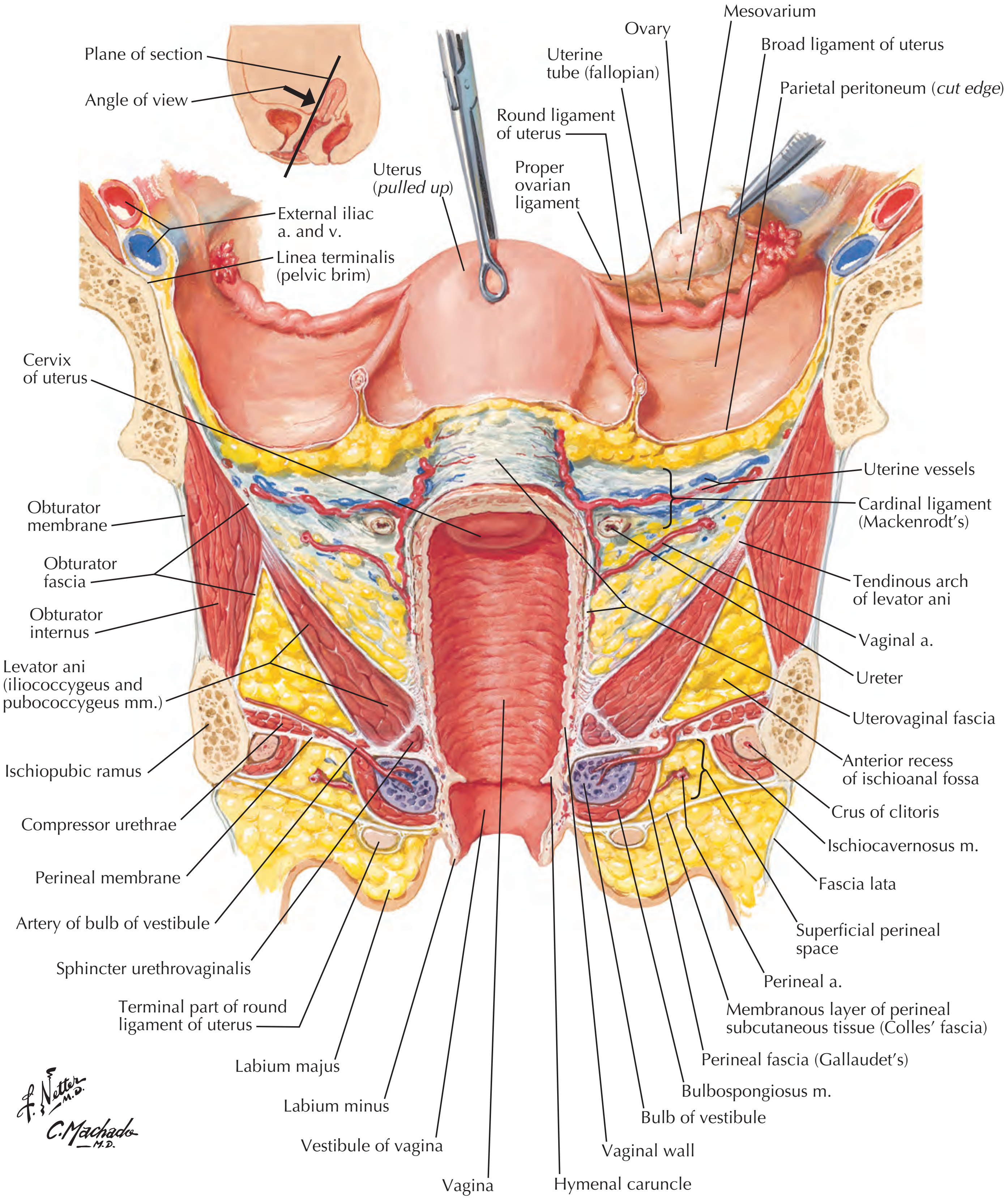


Male: frontal section

Pelvic part of peritoneum
Fundus of bladder
Ductus deferens
Interureteric crest
Right ureteric orifice
Trigone of bladder
Neck of bladder
Vesical venous plexus
Tendinous arch of levator ani
Uvula of bladder
Obturator internus
Levator ani
Capsule of prostate
Prostate
Prostatic utricle
Seminal colliculus
Bulbourethral gland (Cowper's)
External urethral sphincter
Perineal membrane
Spongy urethra
Corpus spongiosum
Perineal fascia (Gallaudet's)
Bulbospongiosus m.
Internal urethral sphincter
Prostatic urethra
Tendinous arch of pelvic fascia
Anterior recess of ischioanal fossa
Ischiopubic ramus
Crus of penis
Ischiocavernosus m.
Membranous layer of perineal subcutaneous tissue (Colles' fascia)

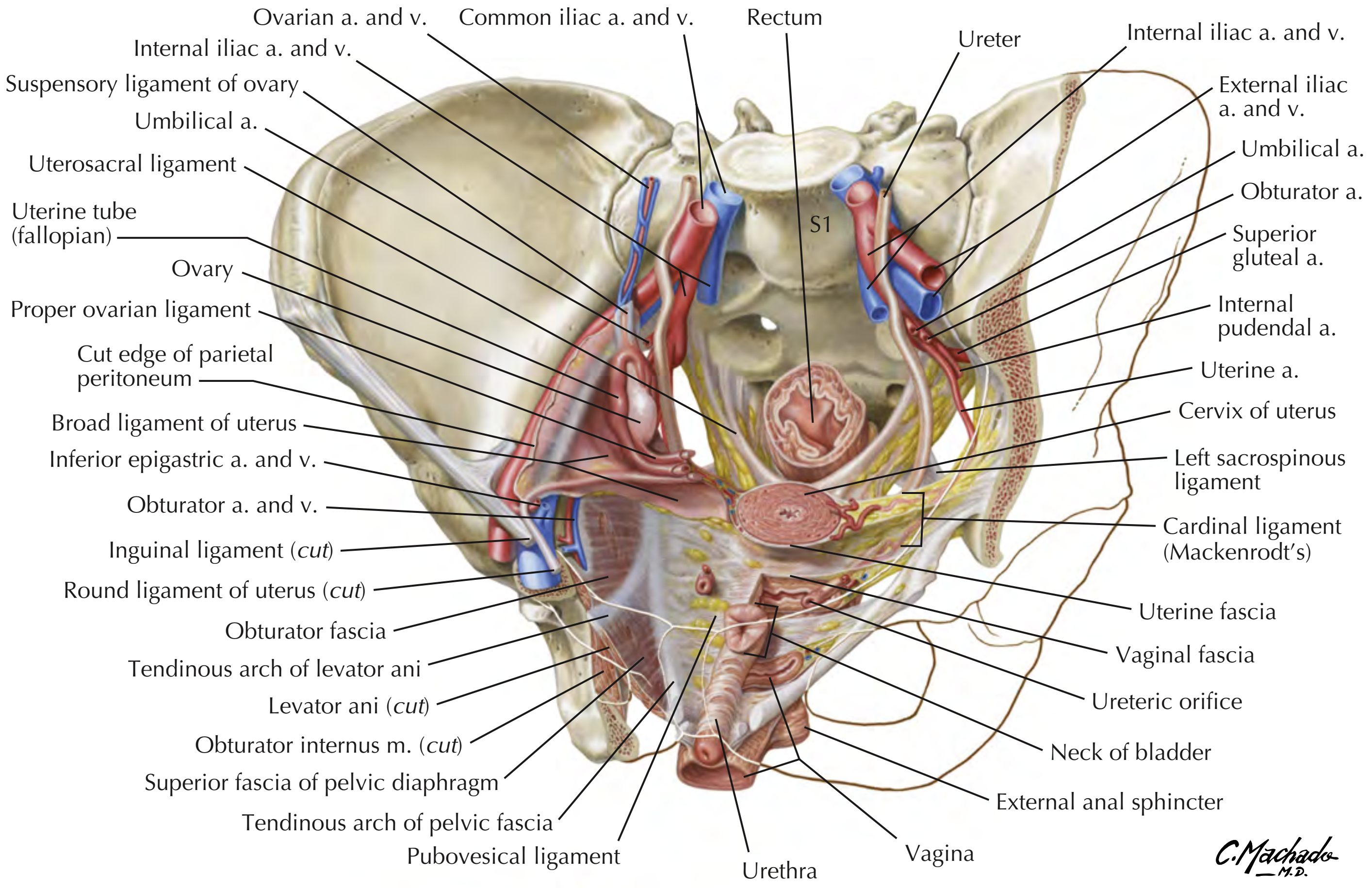
Uterus, Vagina, and Supporting Structures

See also **Plates 406, 408, 414**

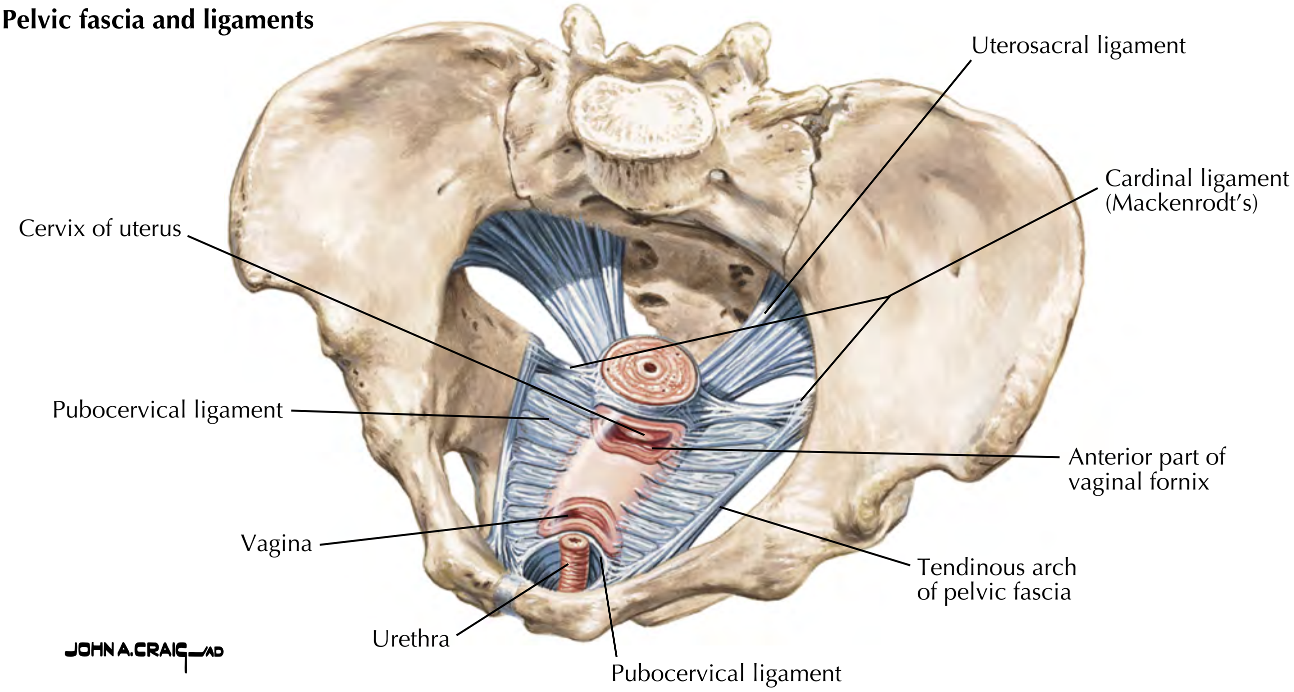

Plane of section
Angle of view
External iliac a. and v.
Linea terminalis (pelvic brim)
Uterus (*pulled up*)
Round ligament of uterus
Proper ovarian ligament
Uterine tube (fallopian)
Ovary
Mesovarium
Broad ligament of uterus
Parietal peritoneum (*cut edge*)
Cervix of uterus
Obturator membrane
Obturator fascia
Obturator internus
Levator ani (iliococcygeus and pubococcygeus mm.)
Ischiopubic ramus
Compressor urethrae
Perineal membrane
Artery of bulb of vestibule
Sphincter urethrovaginalis
Terminal part of round ligament of uterus
Labium majus
Labium minus
Vestibule of vagina
Vagina
Hymenal caruncle
Vaginal wall
Bulb of vestibule
Bulbospongiosus m.
Perineal fascia (Gallaudet's)
Membranous layer of perineal subcutaneous tissue (Colles' fascia)
Perineal a.
Superficial perineal space
Fascia lata
Ischiocavernosus m.
Crus of clitoris
Anterior recess of ischioanal fossa
Uterovaginal fascia
Ureter
Vaginal a.
Tendinous arch of levator ani
Cardinal ligament (Mackenrodt's)
Uterine vessels
F. Netter M.D.
C. Machado M.D.

Uterus: Fascial Ligaments

See also **Plate 366**

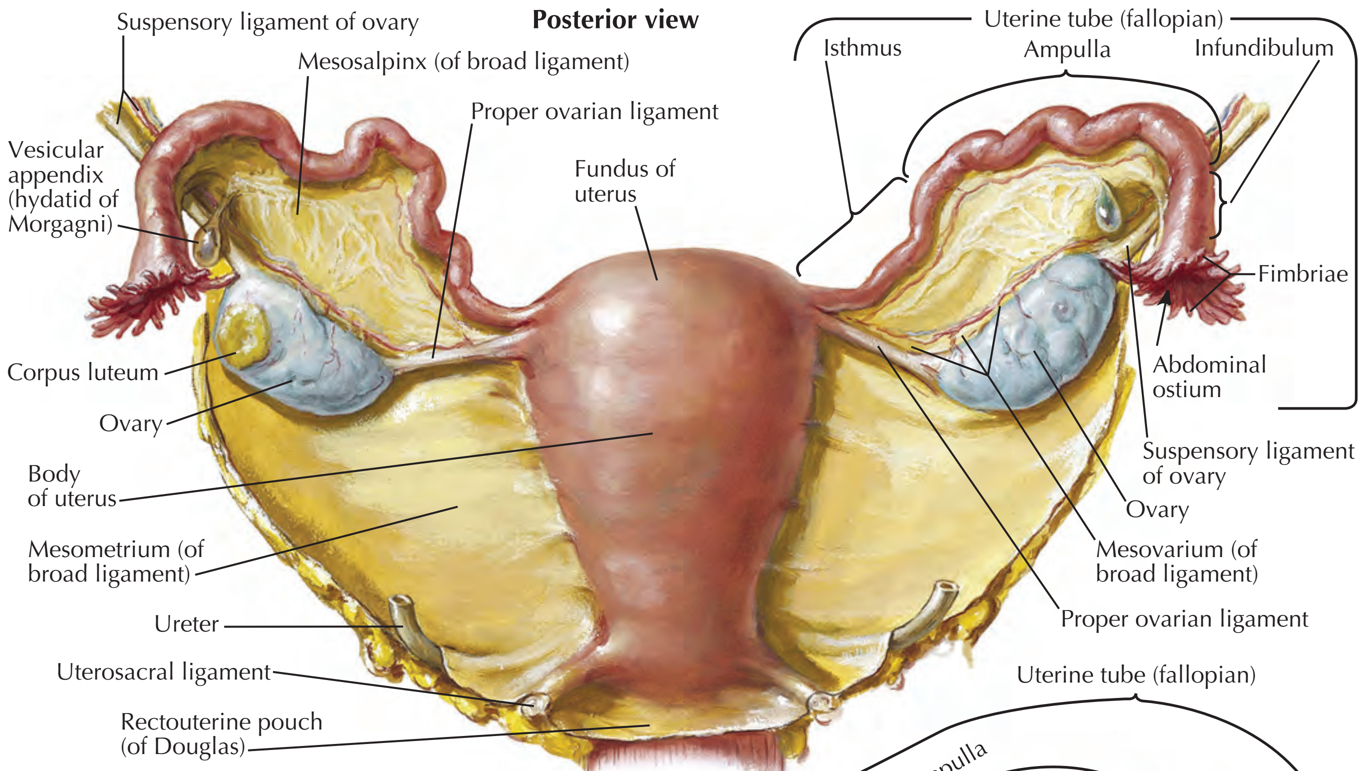

Ovarian a. and v.
Common iliac a. and v.
Rectum
Ureter
Internal iliac a. and v.
Internal iliac a. and v.
Suspensory ligament of ovary
Umbilical a.
Uterosacral ligament
Uterine tube (fallopian)
Ovary
Proper ovarian ligament
Cut edge of parietal peritoneum
Broad ligament of uterus
Inferior epigastric a. and v.
Obturator a. and v.
Inguinal ligament (*cut*)
Round ligament of uterus (*cut*)
Obturator fascia
Tendinous arch of levator ani
Levator ani (*cut*)
Obturator internus m. (*cut*)
Superior fascia of pelvic diaphragm
Tendinous arch of pelvic fascia
Pubovesical ligament
Urethra
Vagina
S1
External iliac a. and v.
Umbilical a.
Obturator a.
Superior gluteal a.
Internal pudendal a.
Uterine a.
Cervix of uterus
Left sacrospinous ligament
Cardinal ligament (Mackenrodt's)
Uterine fascia
Vaginal fascia
Ureteric orifice
Neck of bladder
External anal sphincter
C.Machado M.D.

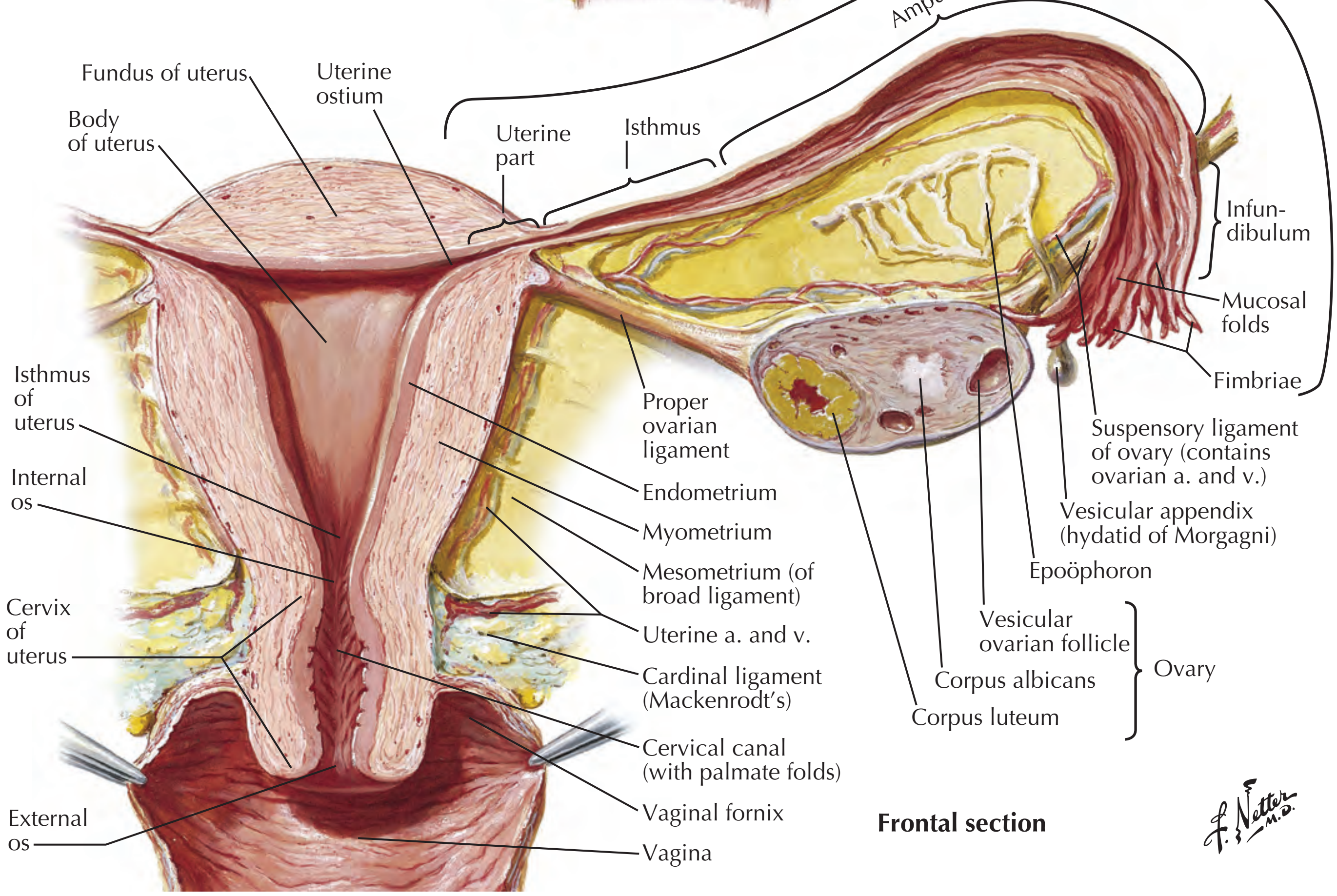
Pelvic fascia and ligaments


Uterosacral ligament
Cardinal ligament (Mackenrodt's)
Cervix of uterus
Pubocervical ligament
Anterior part of vaginal fornix
Vagina
Tendinous arch of pelvic fascia
Urethra
Pubocervical ligament
JOHN A.CRAIG AD

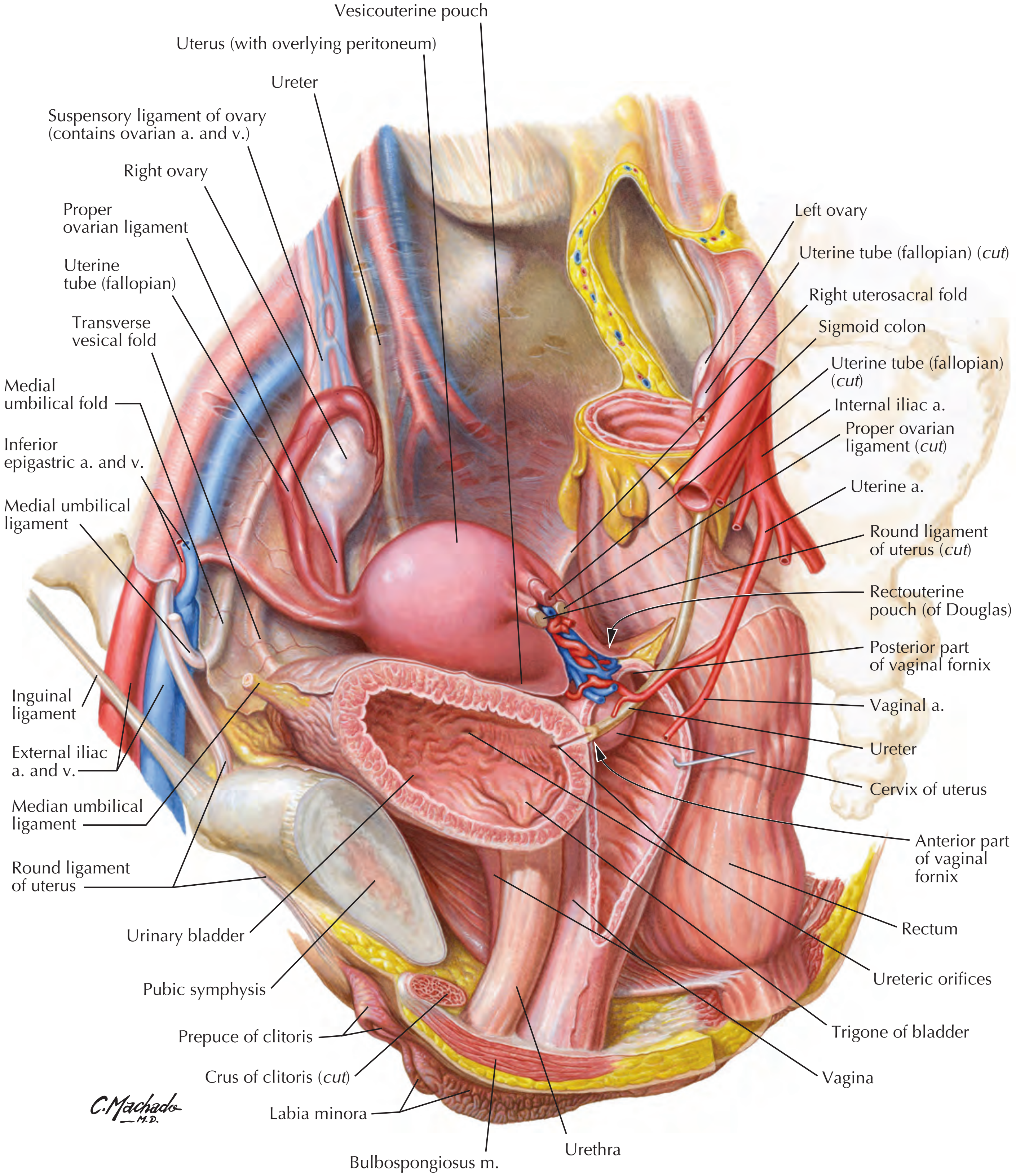
See also **Plates BP 89, BP 90**

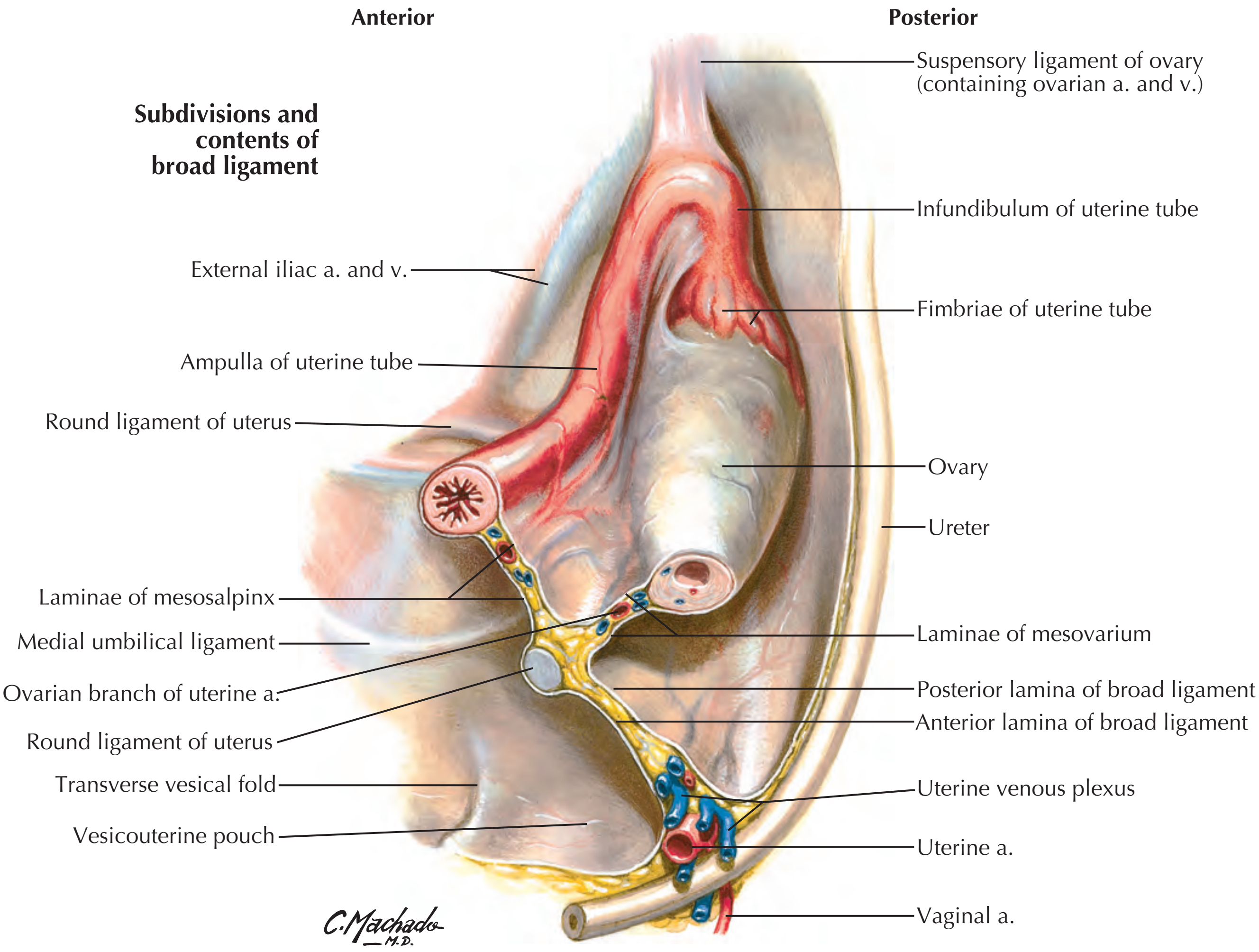
Posterior view


Suspensory ligament of ovary
Mesosalpinx (of broad ligament)
Proper ovarian ligament
Vesicular appendix (hydatid of Morgagni)
Fundus of uterus
Corpus luteum
Ovary
Body of uterus
Mesometrium (of broad ligament)
Ureter
Uterosacral ligament
Rectouterine pouch (of Douglas)
Uterine tube (fallopian)
Isthmus
Ampulla
Infundibulum
Fimbriae
Abdominal ostium
Suspensory ligament of ovary
Ovary
Mesovarium (of broad ligament)
Proper ovarian ligament

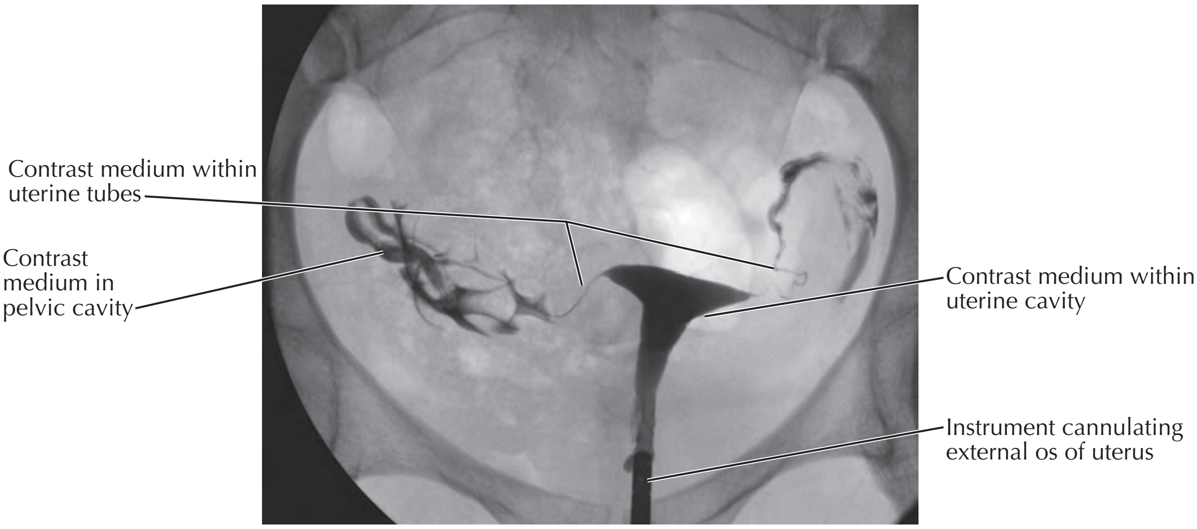

Uterine tube (fallopian)
Ampulla
Fundus of uterus
Uterine ostium
Body of uterus
Uterine part
Isthmus
Infun-dibulum
Mucosal folds
Fimbriae
Isthmus of uterus
Internal os
Cervix of uterus
External os
Proper ovarian ligament
Endometrium
Myometrium
Mesometrium (of broad ligament)
Uterine a. and v.
Cardinal ligament (Mackenrodt's)
Cervical canal (with palmate folds)
Vaginal fornix
Vagina
Suspensory ligament of ovary (contains ovarian a. and v.)
Vesicular appendix (hydatid of Morgagni)
Epoöphoron
Vesicular ovarian follicle
Corpus albicans
Corpus luteum
Ovary
F. Netter M.D.

Frontal section


Vesicouterine pouch
Uterus (with overlying peritoneum)
Ureter
Suspensory ligament of ovary (contains ovarian a. and v.)
Right ovary
Proper ovarian ligament
Uterine tube (fallopian)
Transverse vesical fold
Medial umbilical fold
Inferior epigastric a. and v.
Medial umbilical ligament
Inguinal ligament
External iliac a. and v.
Median umbilical ligament
Round ligament of uterus
Urinary bladder
Pubic symphysis
Prepuce of clitoris
Crus of clitoris (*cut*)
Labia minora
Bulbospongiosus m.
Urethra
Left ovary
Uterine tube (fallopian) (*cut*)
Right uterosacral fold
Sigmoid colon
Uterine tube (fallopian) (*cut*)
Internal iliac a.
Proper ovarian ligament (*cut*)
Uterine a.
Round ligament of uterus (*cut*)
Rectouterine pouch (of Douglas)
Posterior part of vaginal fornix
Vaginal a.
Ureter
Cervix of uterus
Anterior part of vaginal fornix
Rectum
Ureteric orifices
Trigone of bladder
Vagina
C.Machado M.D.

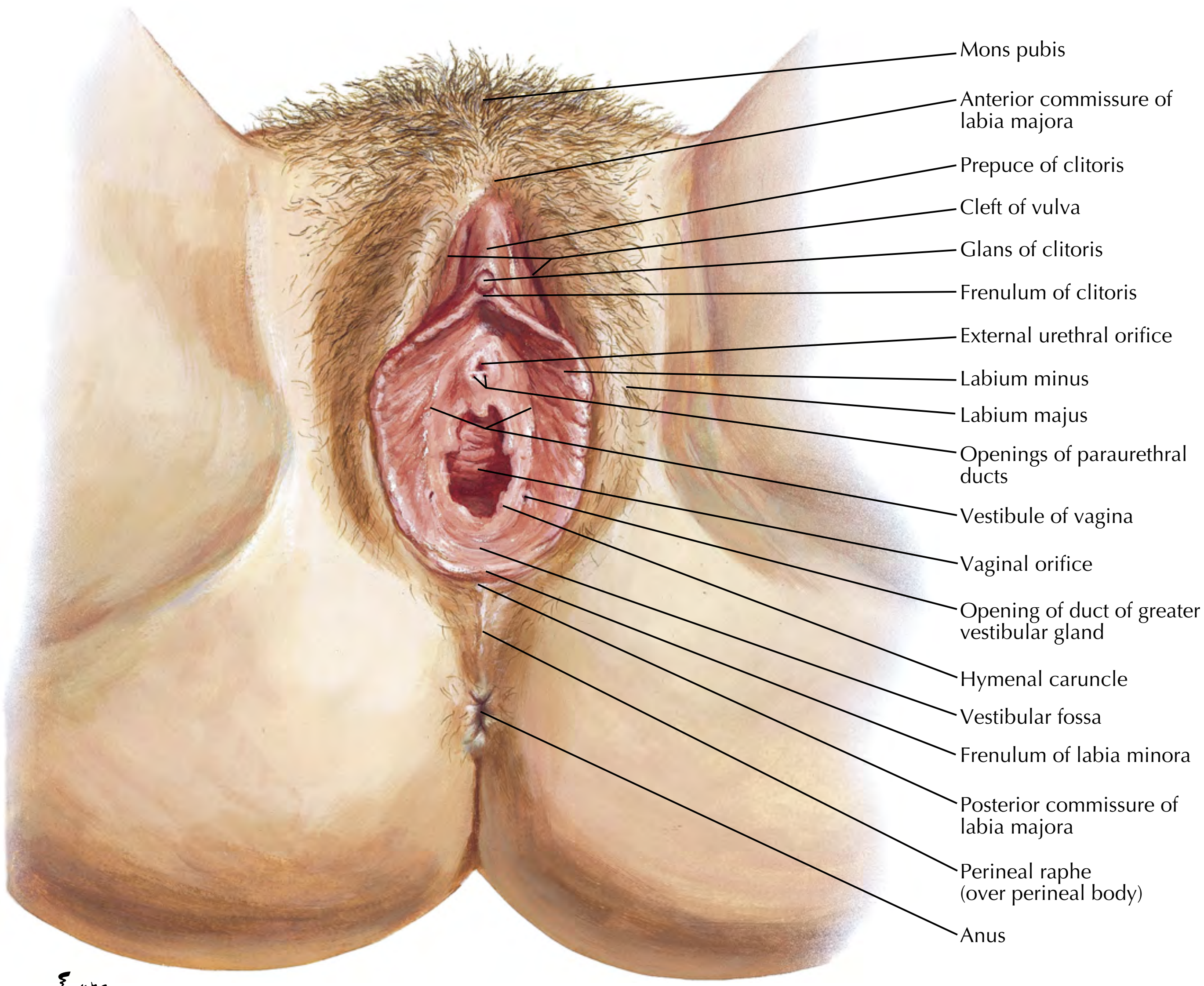

Anterior
Posterior
Subdivisions and contents of broad ligament
Suspensory ligament of ovary (containing ovarian a. and v.)
Infundibulum of uterine tube
Fimbriae of uterine tube
External iliac a. and v.
Ampulla of uterine tube
Round ligament of uterus
Ovary
Ureter
Laminae of mesosalpinx
Medial umbilical ligament
Ovarian branch of uterine a.
Round ligament of uterus
Transverse vesical fold
Vesicouterine pouch
Laminae of mesovarium
Posterior lamina of broad ligament
Anterior lamina of broad ligament
Uterine venous plexus
Uterine a.
Vaginal a.
C. Machado M.D.

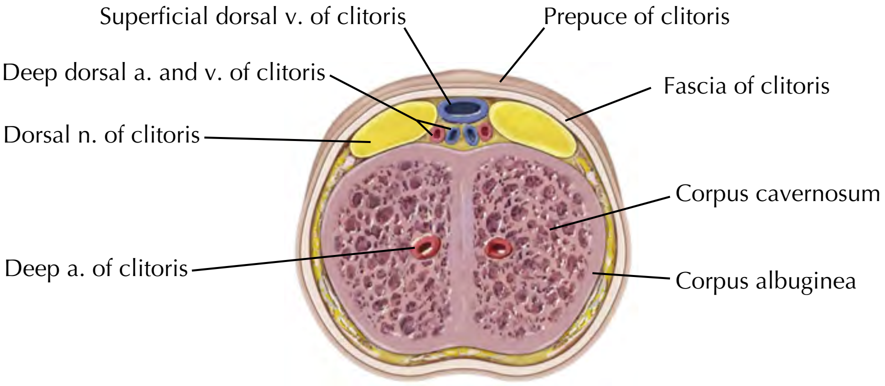
Anteroposterior fluoroscopic image obtained during hysterosalpingography


Contrast medium within uterine tubes
Contrast medium in pelvic cavity
Contrast medium within uterine cavity
Instrument cannulating external os of uterus

Female Perineum and External Genitalia

See also **Plates 406, 409, 415, BP 91**

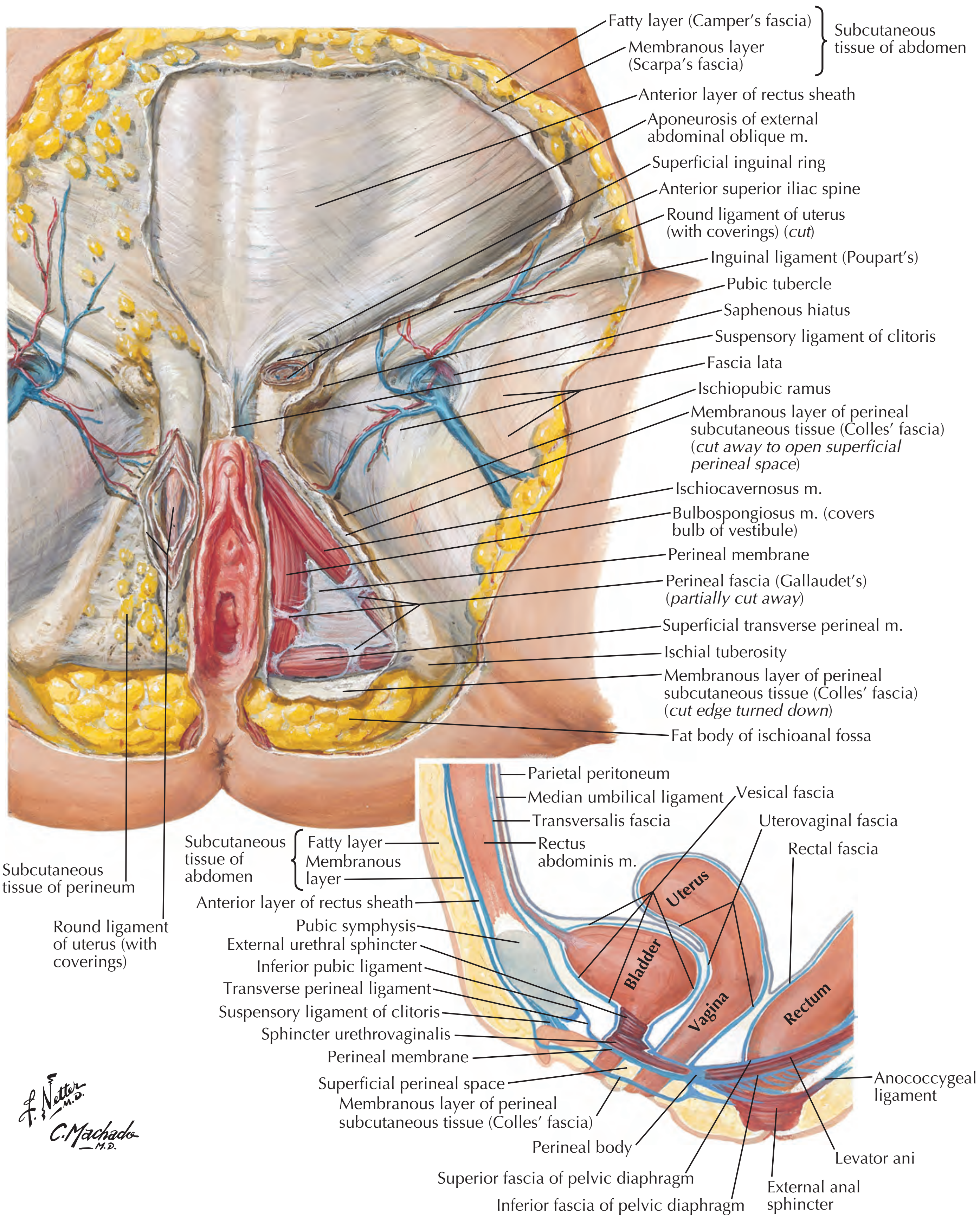

Mons pubis
Anterior commissure of labia majora
Prepuce of clitoris
Cleft of vulva
Glans of clitoris
Frenulum of clitoris
External urethral orifice
Labium minus
Labium majus
Openings of paraurethral ducts
Vestibule of vagina
Vaginal orifice
Opening of duct of greater vestibular gland
Hymenal caruncle
Vestibular fossa
Frenulum of labia minora
Posterior commissure of labia majora
Perineal raphe (over perineal body)
Anus


Superficial dorsal v. of clitoris
Prepuce of clitoris
Deep dorsal a. and v. of clitoris
Fascia of clitoris
Dorsal n. of clitoris
Corpus cavernosum
Deep a. of clitoris
Corpus albuginea

Transverse section through body of clitoris

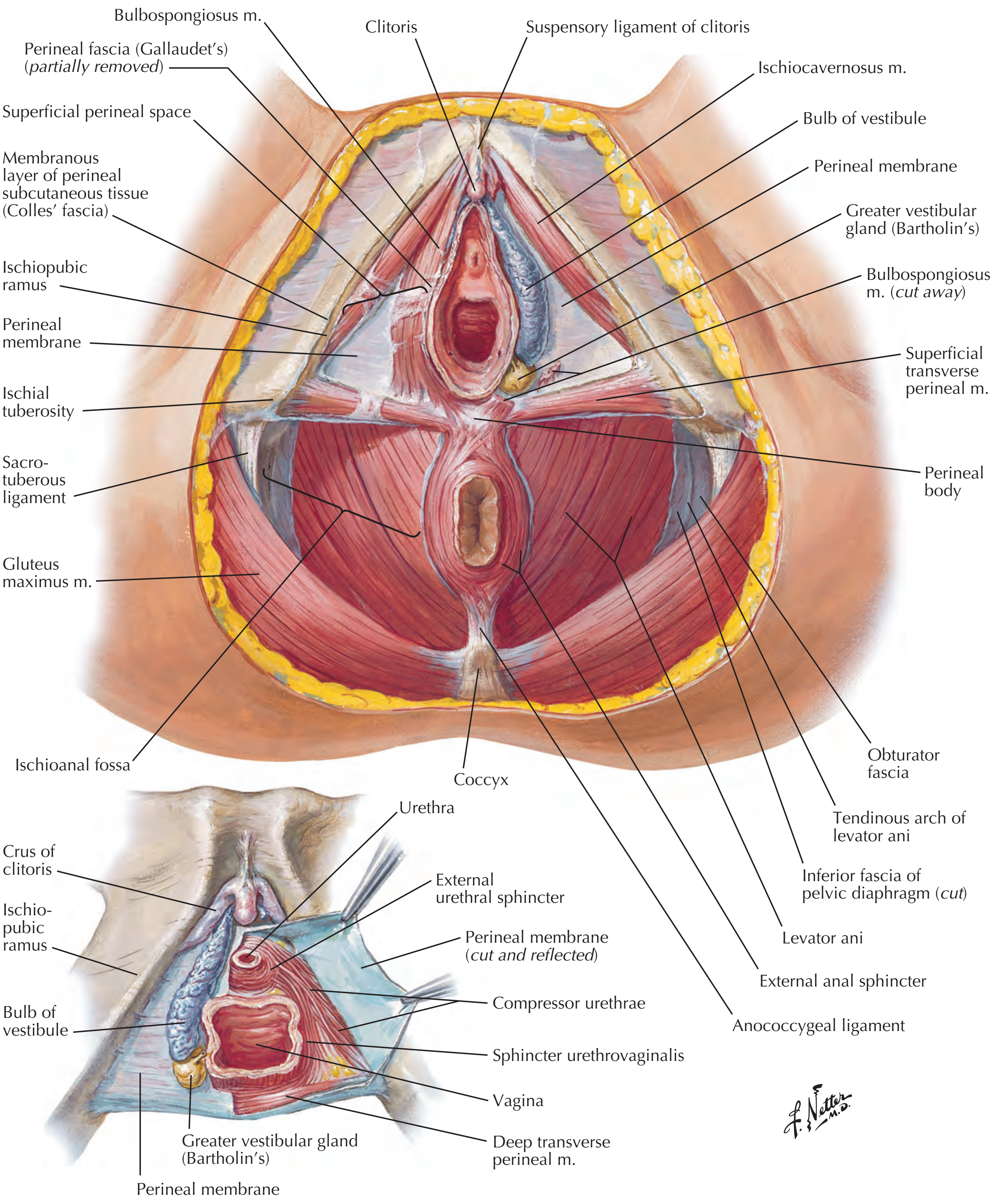
Female Perineum (Superficial Dissection)

See also **Plate BP 84**


Fatty layer (Camper's fascia)
Membranous layer (Scarpa's fascia)
Subcutaneous tissue of abdomen
Anterior layer of rectus sheath
Aponeurosis of external abdominal oblique m.
Superficial inguinal ring
Anterior superior iliac spine
Round ligament of uterus (with coverings) (*cut*)
Inguinal ligament (Poupart's)
Pubic tubercle
Saphenous hiatus
Suspensory ligament of clitoris
Fascia lata
Ischiopubic ramus
Membranous layer of perineal subcutaneous tissue (Colles' fascia) (*cut away to open superficial perineal space*)
Ischiocavernosus m.
Bulbospongiosus m. (covers bulb of vestibule)
Perineal membrane
Perineal fascia (Gallaudet's) (*partially cut away*)
Superficial transverse perineal m.
Ischial tuberosity
Membranous layer of perineal subcutaneous tissue (Colles' fascia) (*cut edge turned down*)
Fat body of ischioanal fossa
Subcutaneous tissue of perineum
Round ligament of uterus (with coverings)
Parietal peritoneum
Median umbilical ligament
Vesical fascia
Transversalis fascia
Uterovaginal fascia
Rectal fascia
Rectus abdominis m.
Subcutaneous tissue of abdomen
Fatty layer
Membranous layer
Anterior layer of rectus sheath
Uterus
Pubic symphysis
External urethral sphincter
Bladder
Inferior pubic ligament
Transverse perineal ligament
Vagina
Rectum
Suspensory ligament of clitoris
Sphincter urethrovaginalis
Perineal membrane
Anococcygeal ligament
Superficial perineal space
Membranous layer of perineal subcutaneous tissue (Colles' fascia)
Perineal body
Levator ani
Superior fascia of pelvic diaphragm
External anal sphincter
Inferior fascia of pelvic diaphragm

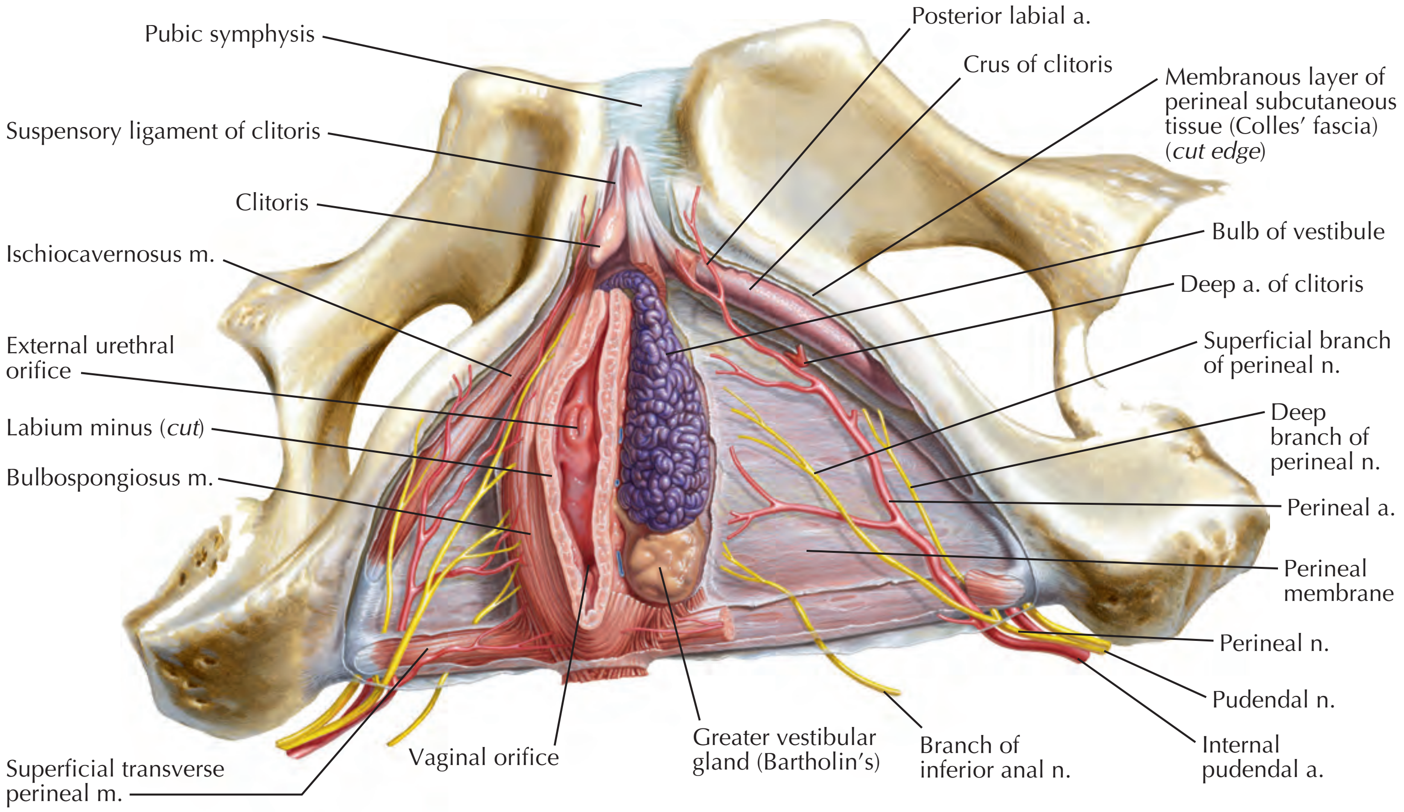
Female Perineum (Deeper Dissection)

See also **Plate BP 86**

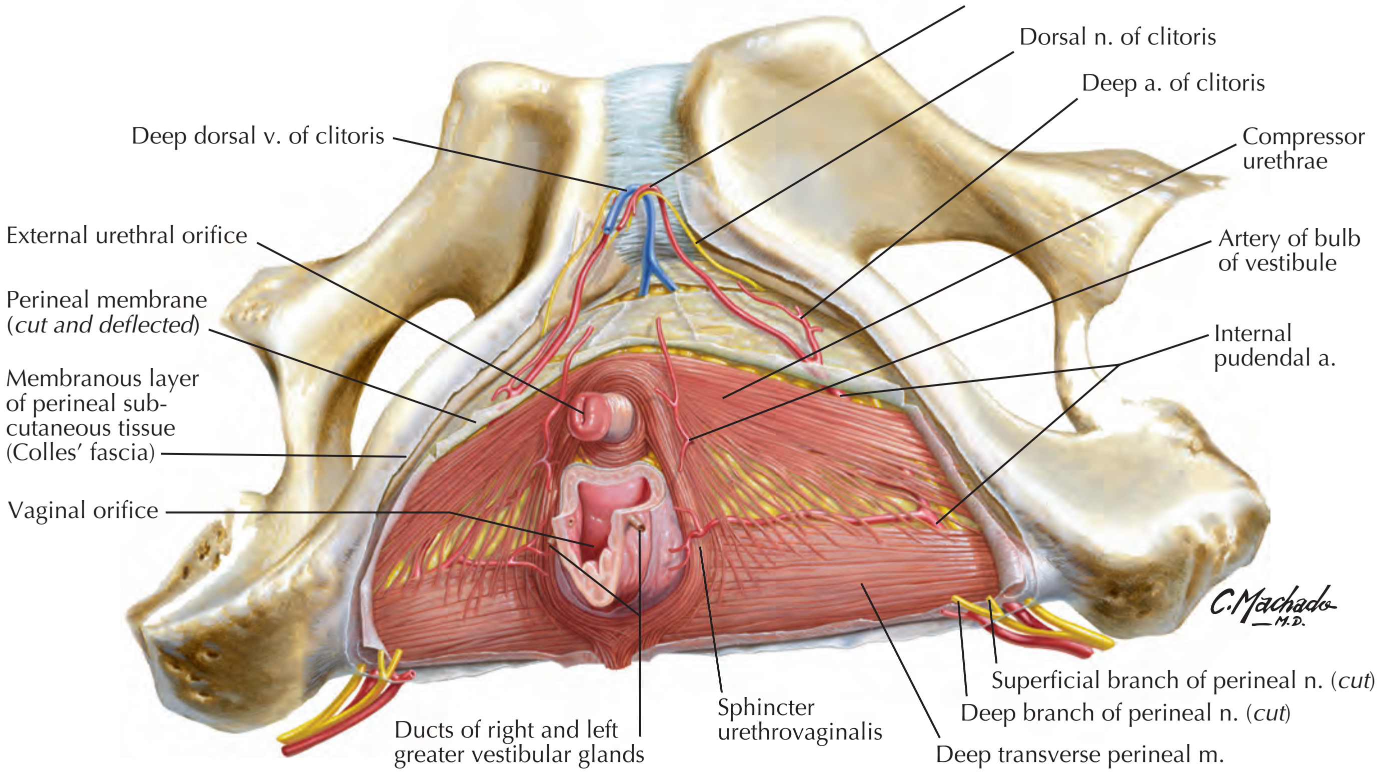

Bulbospongiosus m.
Clitoris
Suspensory ligament of clitoris
Perineal fascia (Gallaudet's) (*partially removed*)
Ischiocavernosus m.
Superficial perineal space
Bulb of vestibule
Perineal membrane
Membranous layer of perineal subcutaneous tissue (Colles' fascia)
Greater vestibular gland (Bartholin's)
Ischiopubic ramus
Bulbospongiosus m. (*cut away*)
Perineal membrane
Superficial transverse perineal m.
Ischial tuberosity
Perineal body
Sacrotuberous ligament
Gluteus maximus m.
Ischioanal fossa
Coccyx
Obturator fascia
Tendinous arch of levator ani
Inferior fascia of pelvic diaphragm (*cut*)
Levator ani
External anal sphincter
Anococcygeal ligament
Urethra
Crus of clitoris
External urethral sphincter
Ischiopubic ramus
Perineal membrane (*cut and reflected*)
Compressor urethrae
Bulb of vestibule
Sphincter urethrovaginalis
Vagina
Deep transverse perineal m.
Greater vestibular gland (Bartholin's)
Perineal membrane

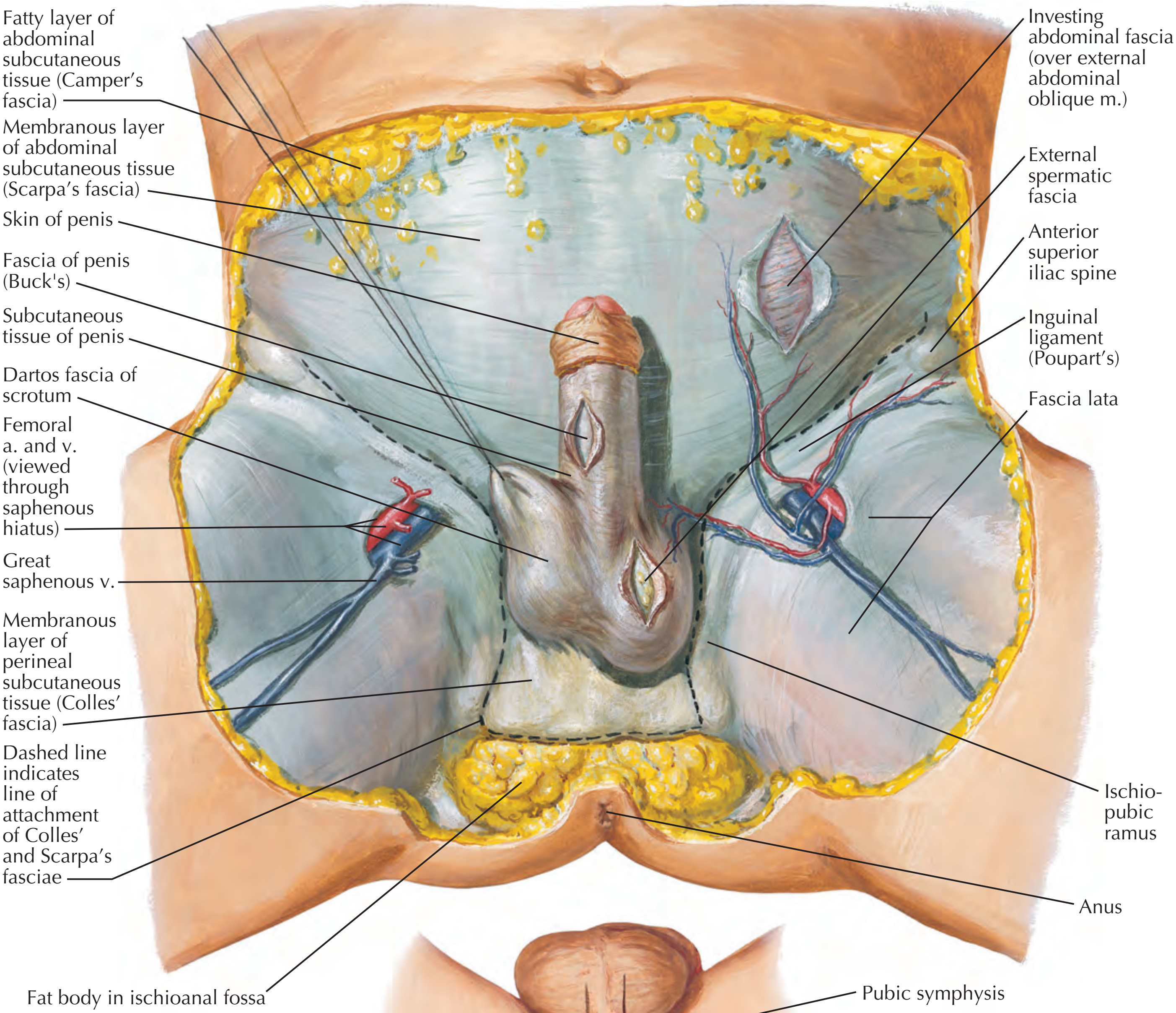
See also **Plates 406, 415, BP 86**

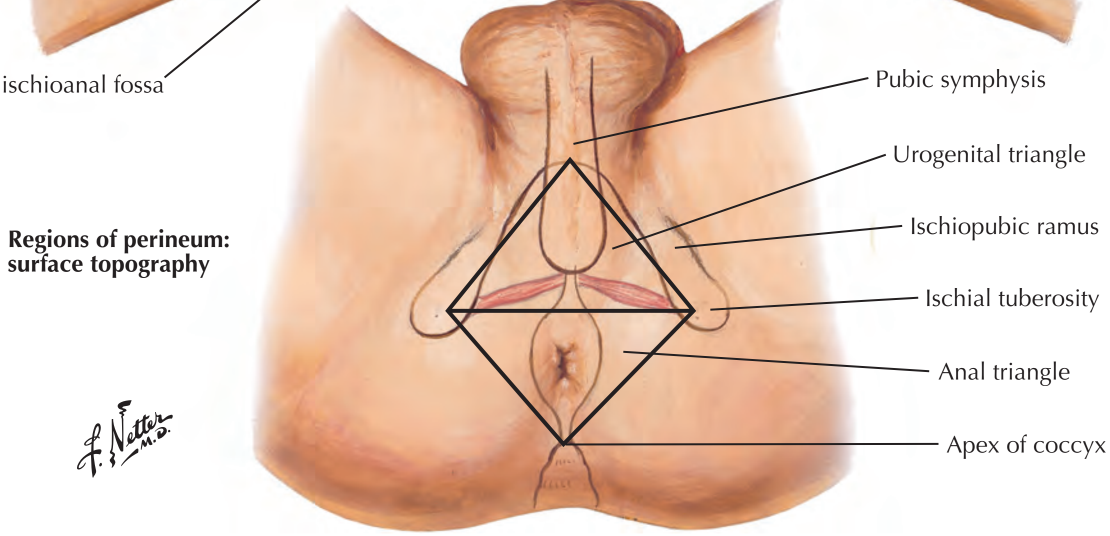
Superficial perineal space


Pubic symphysis
Suspensory ligament of clitoris
Clitoris
Ischiocavernosus m.
External urethral orifice
Labium minus (*cut*)
Bulbospongiosus m.
Superficial transverse perineal m.
Vaginal orifice
Greater vestibular gland (Bartholin's)
Branch of inferior anal n.
Internal pudendal a.
Pudendal n.
Perineal n.
Perineal membrane
Perineal a.
Deep branch of perineal n.
Superficial branch of perineal n.
Deep a. of clitoris
Bulb of vestibule
Membranous layer of perineal subcutaneous tissue (Colles' fascia) (*cut edge*)
Crus of clitoris
Posterior labial a.

Deep perineal space


Dorsal a. of clitoris
Dorsal n. of clitoris
Deep a. of clitoris
Deep dorsal v. of clitoris
Compressor urethrae
External urethral orifice
Artery of bulb of vestibule
Perineal membrane (*cut and deflected*)
Internal pudendal a.
Membranous layer of perineal subcutaneous tissue (Colles' fascia)
Vaginal orifice
C.Machado M.D.
Superficial branch of perineal n. (*cut*)
Deep branch of perineal n. (*cut*)
Ducts of right and left greater vestibular glands
Sphincter urethrovaginalis
Deep transverse perineal m.

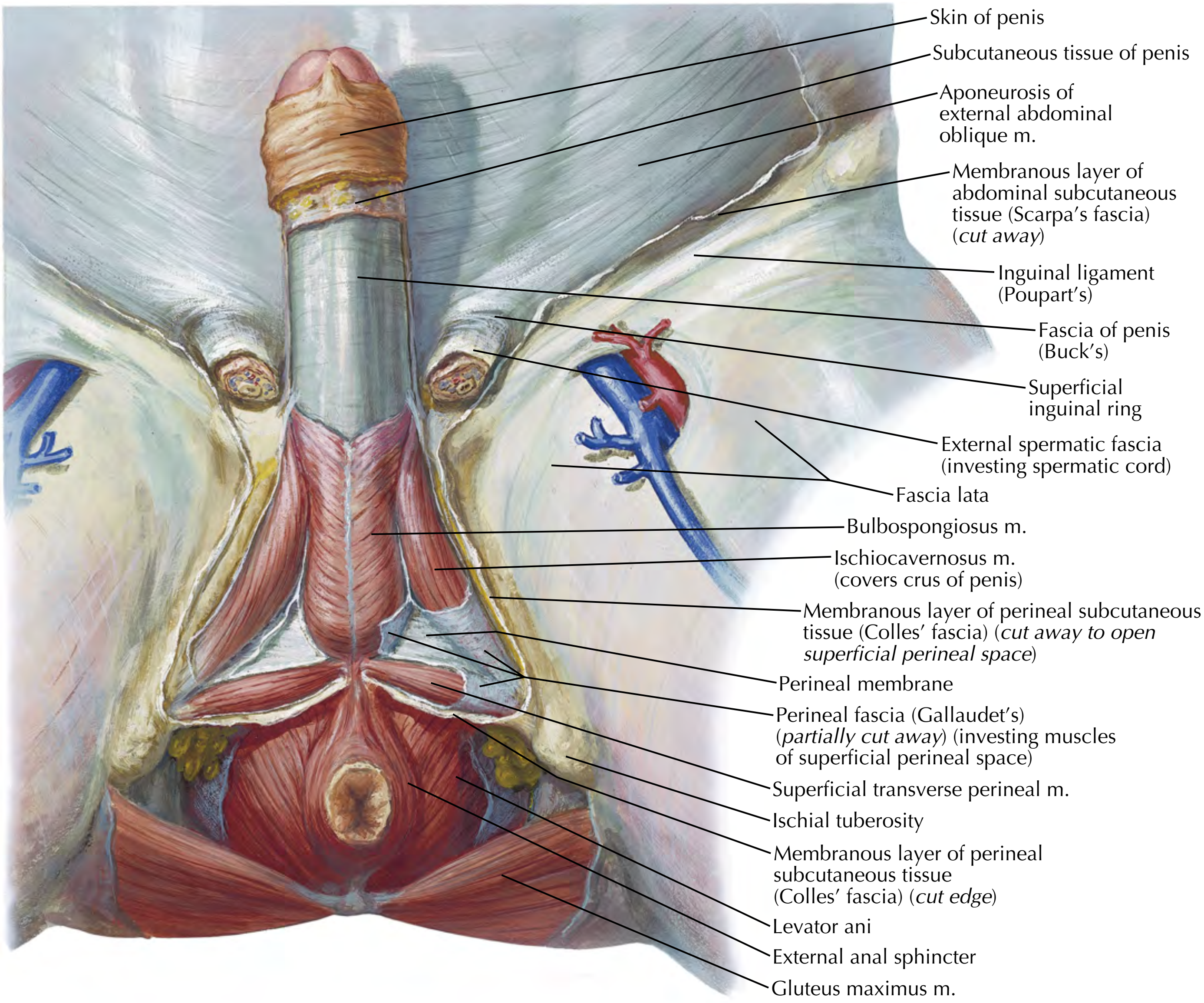

Fatty layer of abdominal subcutaneous tissue (Camper's fascia)
Membranous layer of abdominal subcutaneous tissue (Scarpa's fascia)
Skin of penis
Fascia of penis (Buck's)
Subcutaneous tissue of penis
Dartos fascia of scrotum
Femoral a. and v. (viewed through saphenous hiatus)
Great saphenous v.
Membranous layer of perineal subcutaneous tissue (Colles' fascia)
Dashed line indicates line of attachment of Colles' and Scarpa's fasciae
Fat body in ischioanal fossa
Investing abdominal fascia (over external abdominal oblique m.)
External spermatic fascia
Anterior superior iliac spine
Inguinal ligament (Poupart's)
Fascia lata
Ischio-pubic ramus
Anus

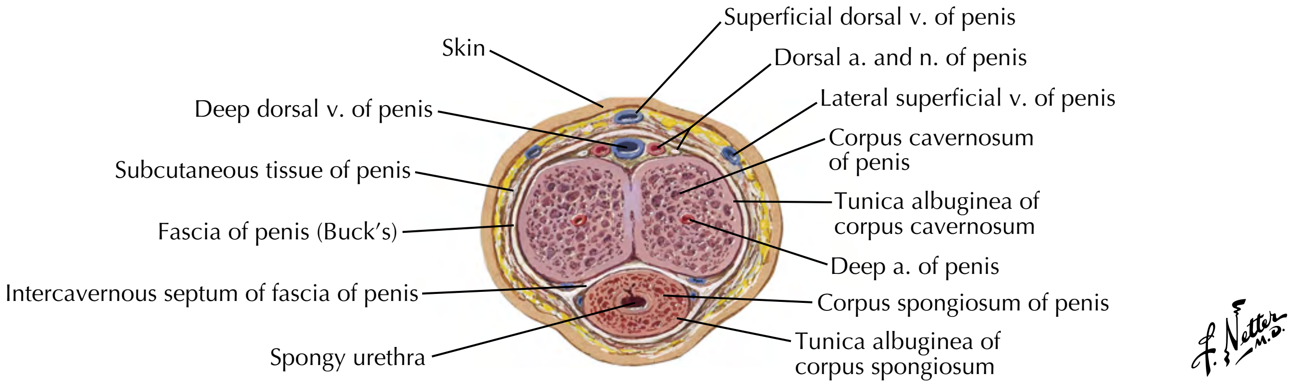

Regions of perineum: surface topography

Pubic symphysis
Urogenital triangle
Ischiopubic ramus
Ischial tuberosity
Anal triangle
Apex of coccyx

Male Perineum and External Genitalia (Deeper Dissection)

See also **Plates 391, 403, 405, 407, BP 84**

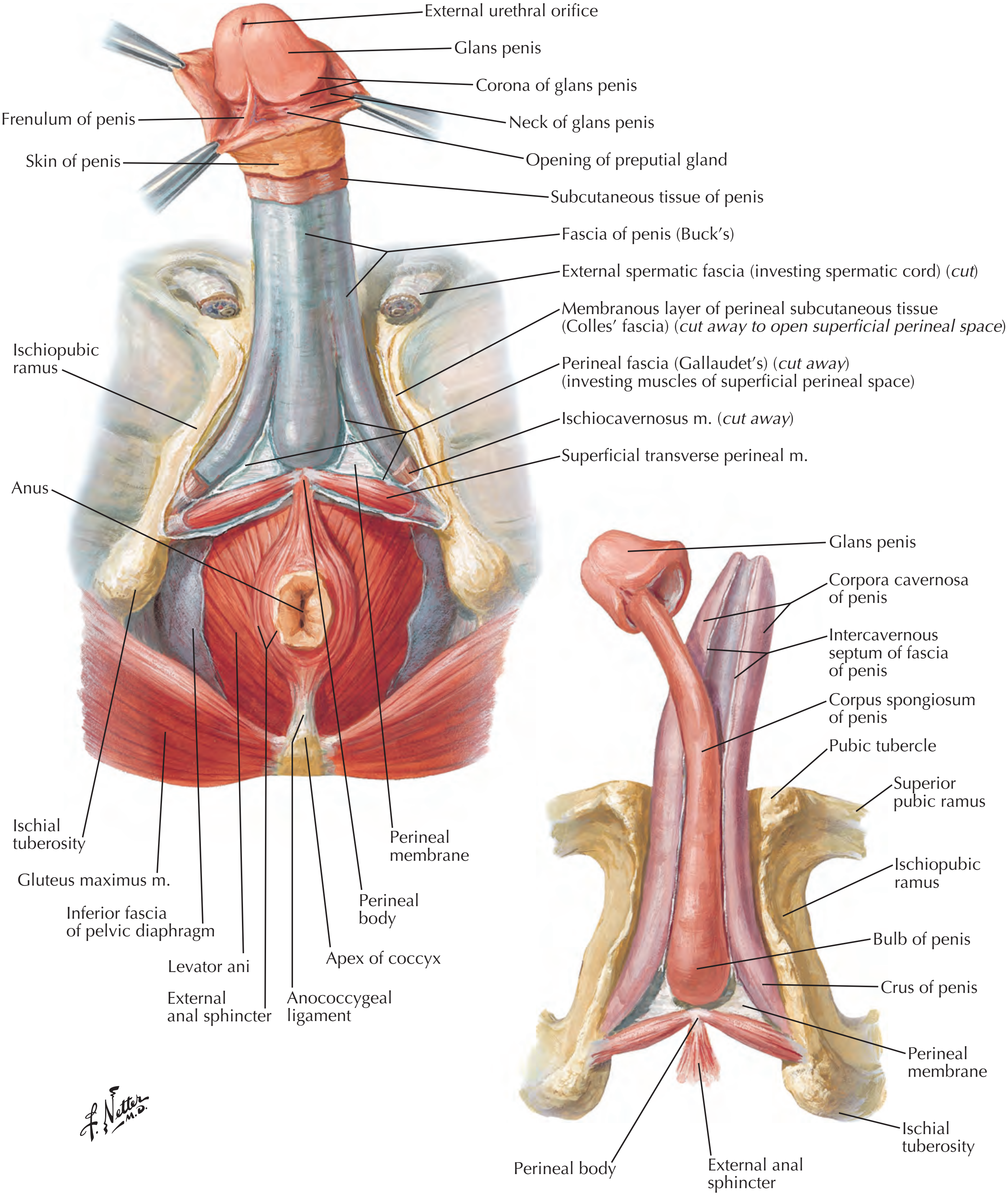

Skin of penis
Subcutaneous tissue of penis
Aponeurosis of external abdominal oblique m.
Membranous layer of abdominal subcutaneous tissue (Scarpa's fascia) (*cut away*)
Inguinal ligament (Poupart's)
Fascia of penis (Buck's)
Superficial inguinal ring
External spermatic fascia (investing spermatic cord)
Fascia lata
Bulbospongiosus m.
Ischiocavernosus m. (covers crus of penis)
Membranous layer of perineal subcutaneous tissue (Colles' fascia) (*cut away to open superficial perineal space*)
Perineal membrane
Perineal fascia (Gallaudet's) (*partially cut away*) (investing muscles of superficial perineal space)
Superficial transverse perineal m.
Ischial tuberosity
Membranous layer of perineal subcutaneous tissue (Colles' fascia) (*cut edge*)
Levator ani
External anal sphincter
Gluteus maximus m.


Skin
Superficial dorsal v. of penis
Dorsal a. and n. of penis
Lateral superficial v. of penis
Deep dorsal v. of penis
Corpus cavernosum of penis
Subcutaneous tissue of penis
Tunica albuginea of corpus cavernosum
Fascia of penis (Buck's)
Deep a. of penis
Intercavernous septum of fascia of penis
Corpus spongiosum of penis
Spongy urethra
Tunica albuginea of corpus spongiosum
F. Netter M.D.

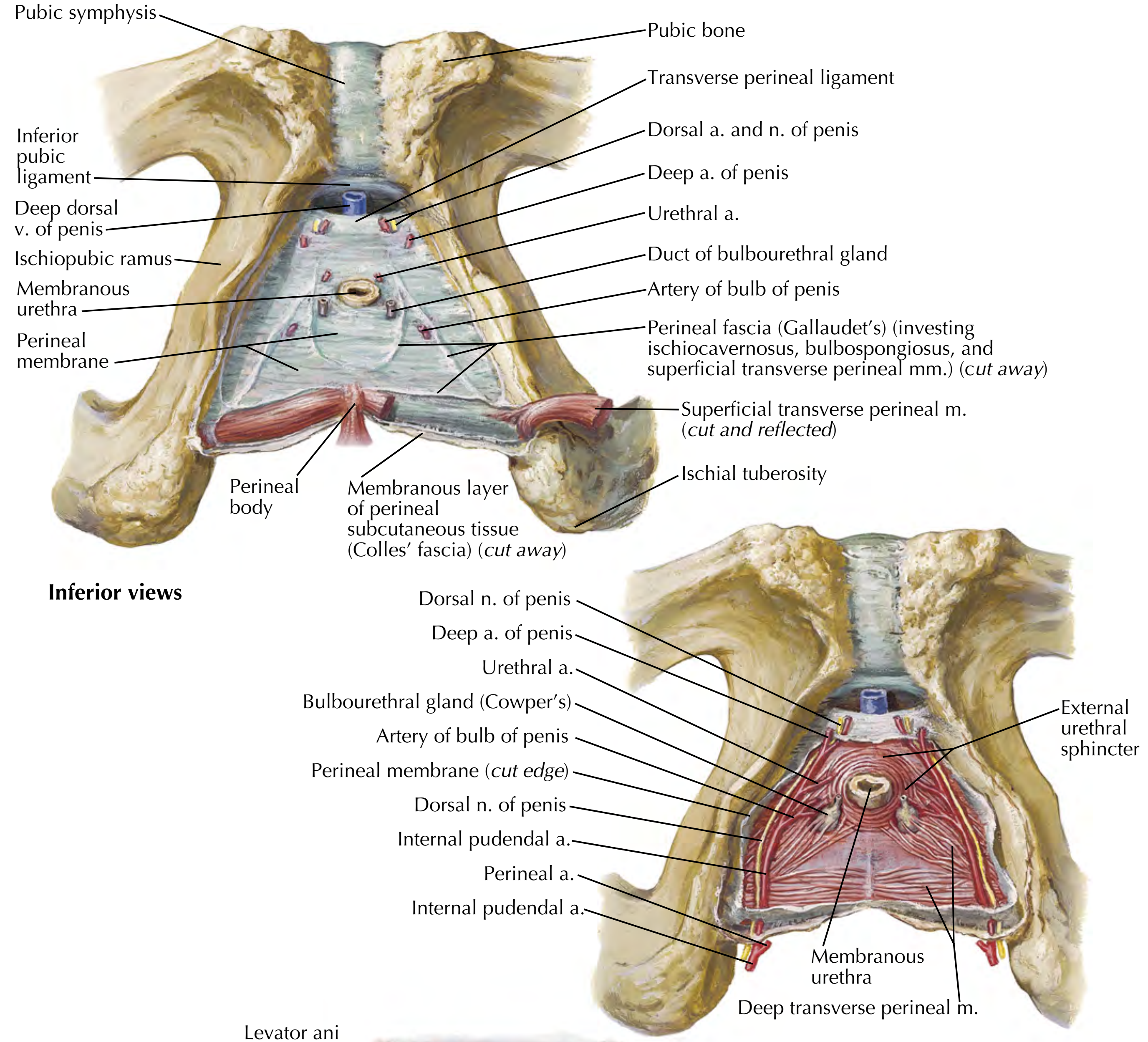
Transverse section through body of penis

Penis

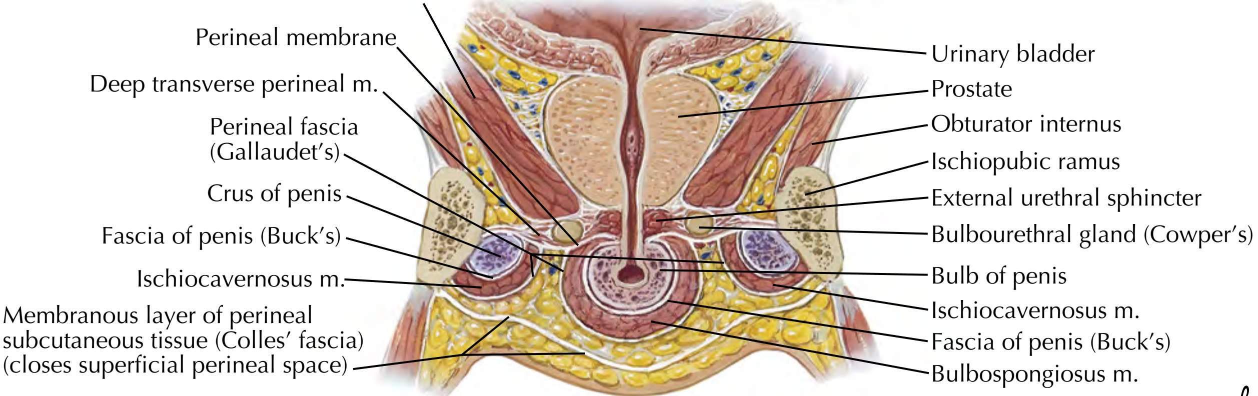
See also **Plate 391**



External urethral orifice
Glans penis
Corona of glans penis
Neck of glans penis
Frenulum of penis
Opening of preputial gland
Skin of penis
Subcutaneous tissue of penis
Fascia of penis (Buck's)
External spermatic fascia (investing spermatic cord) (*cut*)
Membranous layer of perineal subcutaneous tissue (Colles' fascia) (*cut away to open superficial perineal space*)
Ischiopubic ramus
Perineal fascia (Gallaudet's) (*cut away*) (investing muscles of superficial perineal space)
Ischiocavernosus m. (*cut away*)
Superficial transverse perineal m.
Anus
Ischial tuberosity
Gluteus maximus m.
Inferior fascia of pelvic diaphragm
Levator ani
External anal sphincter
Anococcygeal ligament
Apex of coccyx
Perineal body
Perineal membrane
Glans penis
Corpora cavernosa of penis
Intercavernous septum of fascia of penis
Corpus spongiosum of penis
Pubic tubercle
Superior pubic ramus
Ischiopubic ramus
Bulb of penis
Crus of penis
Perineal membrane
Ischial tuberosity
Perineal body
External anal sphincter


Pubic symphysis
Pubic bone
Transverse perineal ligament
Inferior pubic ligament
Dorsal a. and n. of penis
Deep a. of penis
Deep dorsal v. of penis
Urethral a.
Ischiopubic ramus
Duct of bulbourethral gland
Membranous urethra
Artery of bulb of penis
Perineal membrane
Perineal fascia (Gallaudet's) (investing ischiocavernosus, bulbospongiosus, and superficial transverse perineal mm.) (*cut away*)
Superficial transverse perineal m. (*cut and reflected*)
Perineal body
Membranous layer of perineal subcutaneous tissue (Colles' fascia) (*cut away*)
Ischial tuberosity
Dorsal n. of penis
Deep a. of penis
Urethral a.
Bulbourethral gland (Cowper's)
Artery of bulb of penis
Perineal membrane (*cut edge*)
Dorsal n. of penis
Internal pudendal a.
Perineal a.
Internal pudendal a.
External urethral sphincter
Membranous urethra
Deep transverse perineal m.

Inferior views


Levator ani
Perineal membrane
Deep transverse perineal m.
Perineal fascia (Gallaudet's)
Crus of penis
Fascia of penis (Buck's)
Ischiocavernosus m.
Membranous layer of perineal subcutaneous tissue (Colles' fascia) (closes superficial perineal space)
Urinary bladder
Prostate
Obturator internus
Ischiopubic ramus
External urethral sphincter
Bulbourethral gland (Cowper's)
Bulb of penis
Ischiocavernosus m.
Fascia of penis (Buck's)
Bulbospongiosus m.

Frontal section, anterior view of perineum: schema

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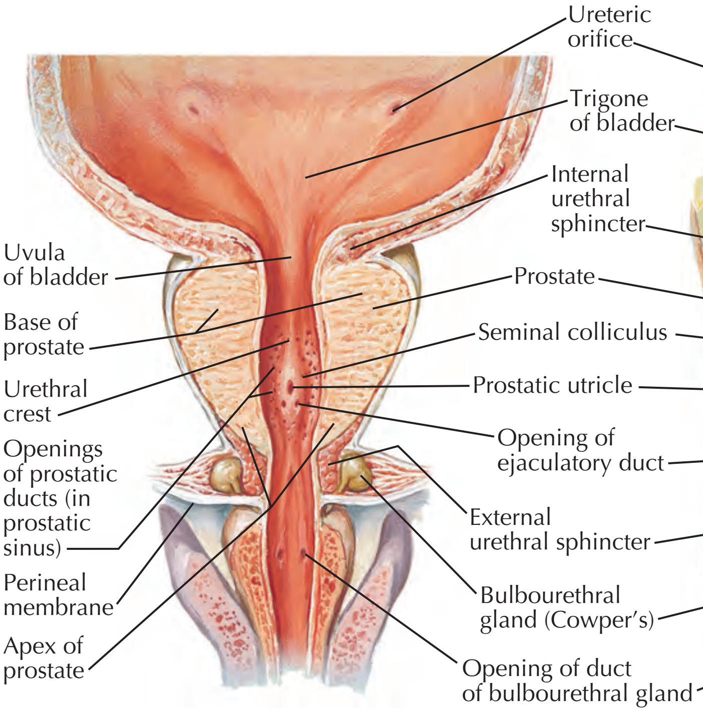
C. Machado M.D.

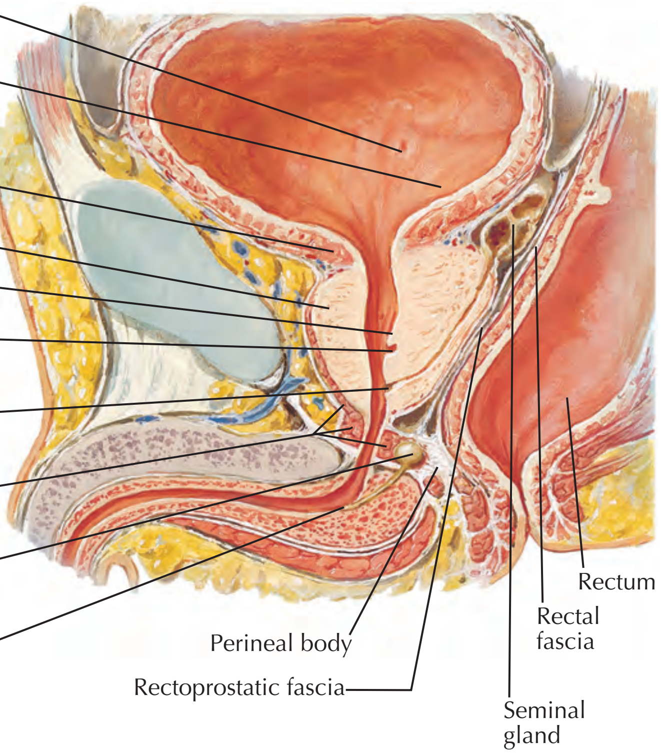
Prostate and Seminal Gland

See also **Plates 368, 371, 405, BP 93**



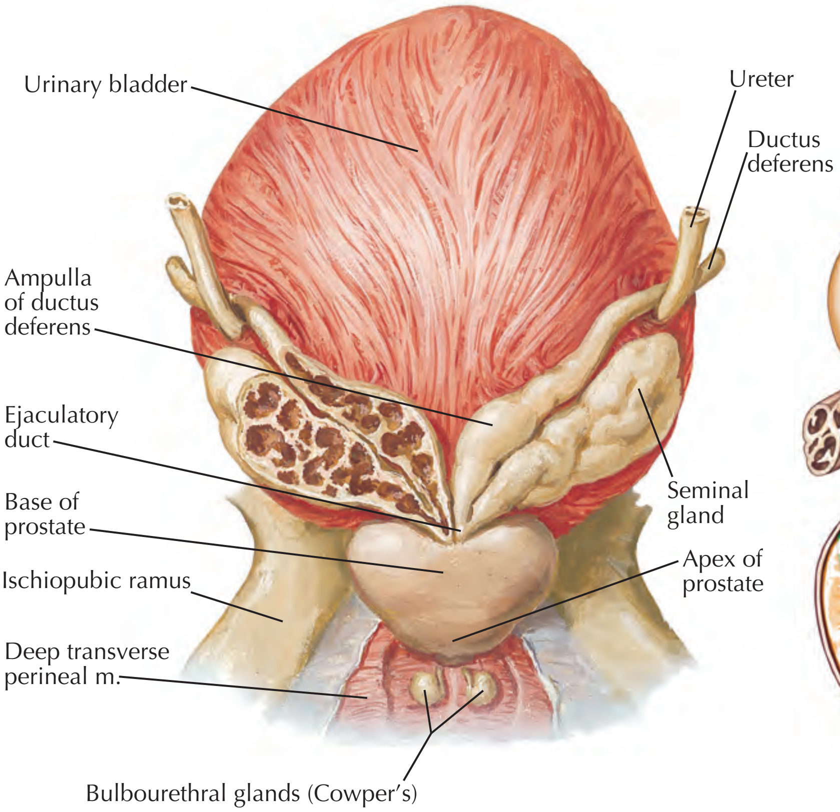
Ureteric orifice
Trigone of bladder
Internal urethral sphincter
Uvula of bladder
Prostate
Base of prostate
Seminal colliculus
Urethral crest
Prostatic utricle
Openings of prostatic ducts (in prostatic sinus)
Opening of ejaculatory duct
External urethral sphincter
Perineal membrane
Bulbourethral gland (Cowper's)
Apex of prostate
Opening of duct of bulbourethral gland

Anterior view of coronal section



Rectum
Rectal fascia
Perineal body
Rectoprostatic fascia
Seminal gland

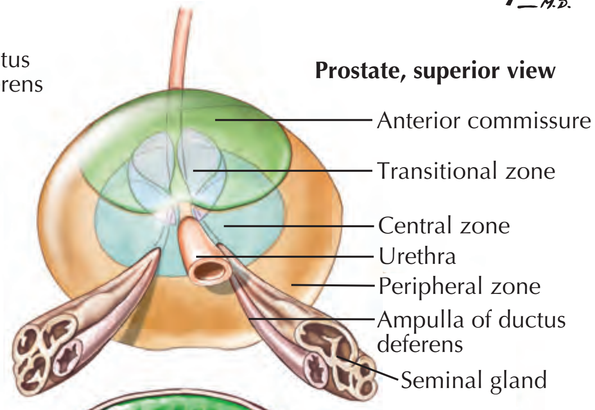
Sagittal section



Urinary bladder
Ureter
Ductus deferens
Ampulla of ductus deferens
Ejaculatory duct
Seminal gland
Base of prostate
Ischiopubic ramus
Apex of prostate
Deep transverse perineal m.
Bulbourethral glands (Cowper's)

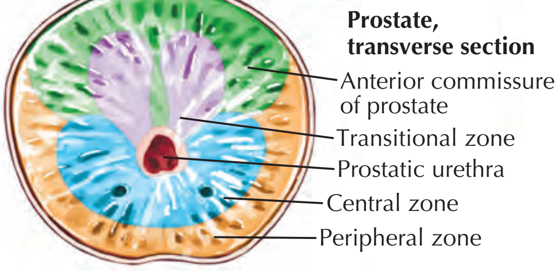
Posterior view

Prostate, superior view

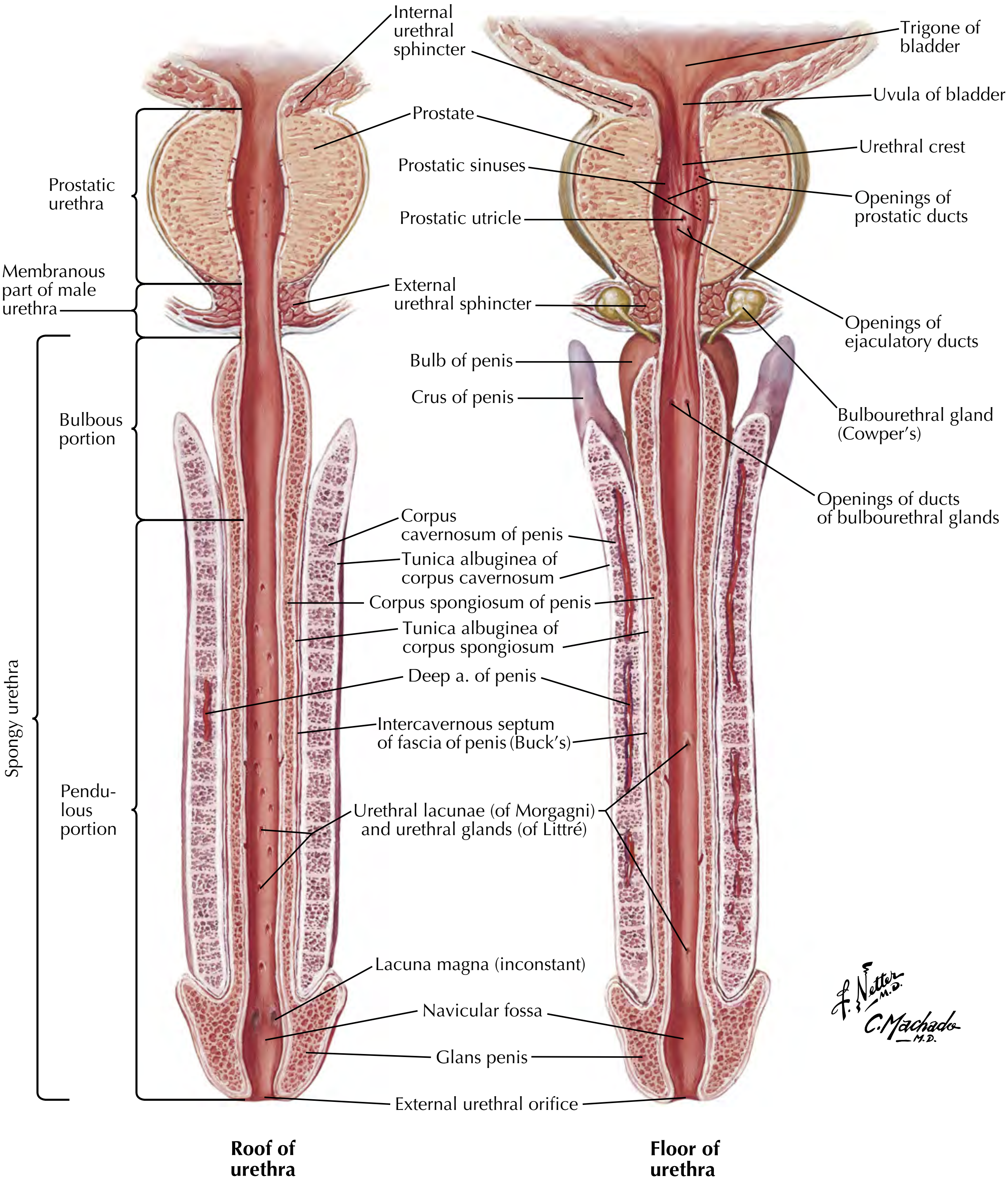


Anterior commissure
Transitional zone
Central zone
Urethra
Peripheral zone
Ampulla of ductus deferens
Seminal gland

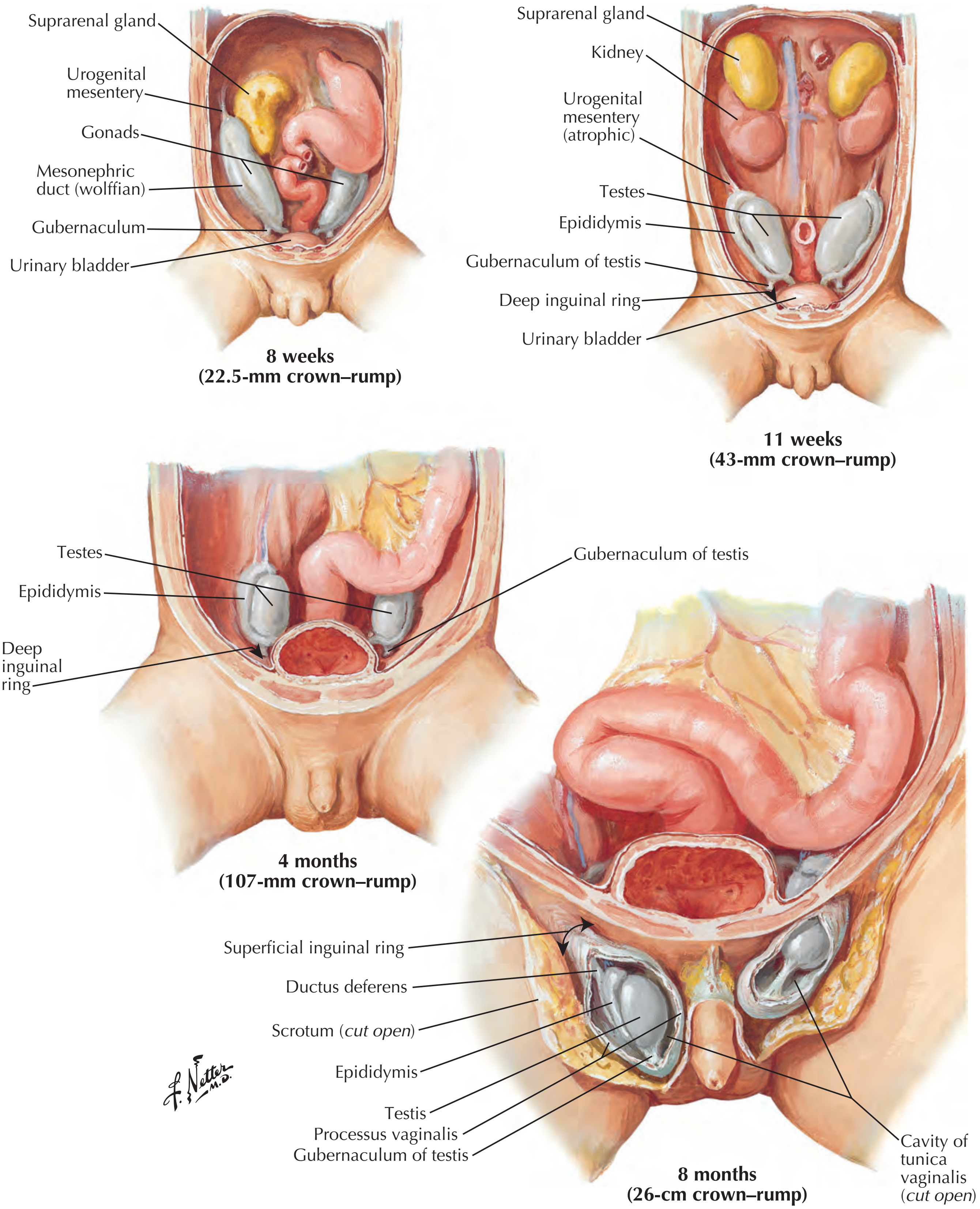
Prostate, transverse section



Anterior commissure of prostate
Transitional zone
Prostatic urethra
Central zone
Peripheral zone


Internal urethral sphincter
Trigone of bladder
Uvula of bladder
Prostate
Urethral crest
Prostatic sinuses
Openings of prostatic ducts
Prostatic utricle
Prostatic urethra
Membranous part of male urethra
External urethral sphincter
Openings of ejaculatory ducts
Bulb of penis
Crus of penis
Bulbourethral gland (Cowper's)
Bulbous portion
Openings of ducts of bulbourethral glands
Corpus cavernosum of penis
Tunica albuginea of corpus cavernosum
Corpus spongiosum of penis
Tunica albuginea of corpus spongiosum
Deep a. of penis
Spongy urethra
Intercavernous septum of fascia of penis (Buck's)
Pendu-lous portion
Urethral lacunae (of Morgagni) and urethral glands (of Littré)
Lacuna magna (inconstant)
Navicular fossa
Glans penis
External urethral orifice
F. Netter M.D.
C. Machado M.D.
Roof of urethra
Floor of urethra

Descent of Testis


Suprarenal gland
Urogenital mesentery
Gonads
Mesonephric duct (wolffian)
Gubernaculum
Urinary bladder
Suprarenal gland
Kidney
Urogenital mesentery (atrophic)
Testes
Epididymis
Gubernaculum of testis
Deep inguinal ring
Urinary bladder
Testes
Epididymis
Deep inguinal ring
Gubernaculum of testis
Superficial inguinal ring
Ductus deferens
Scrotum (*cut open*)
Epididymis
Testis
Processus vaginalis
Gubernaculum of testis
Cavity of tunica vaginalis (*cut open*)

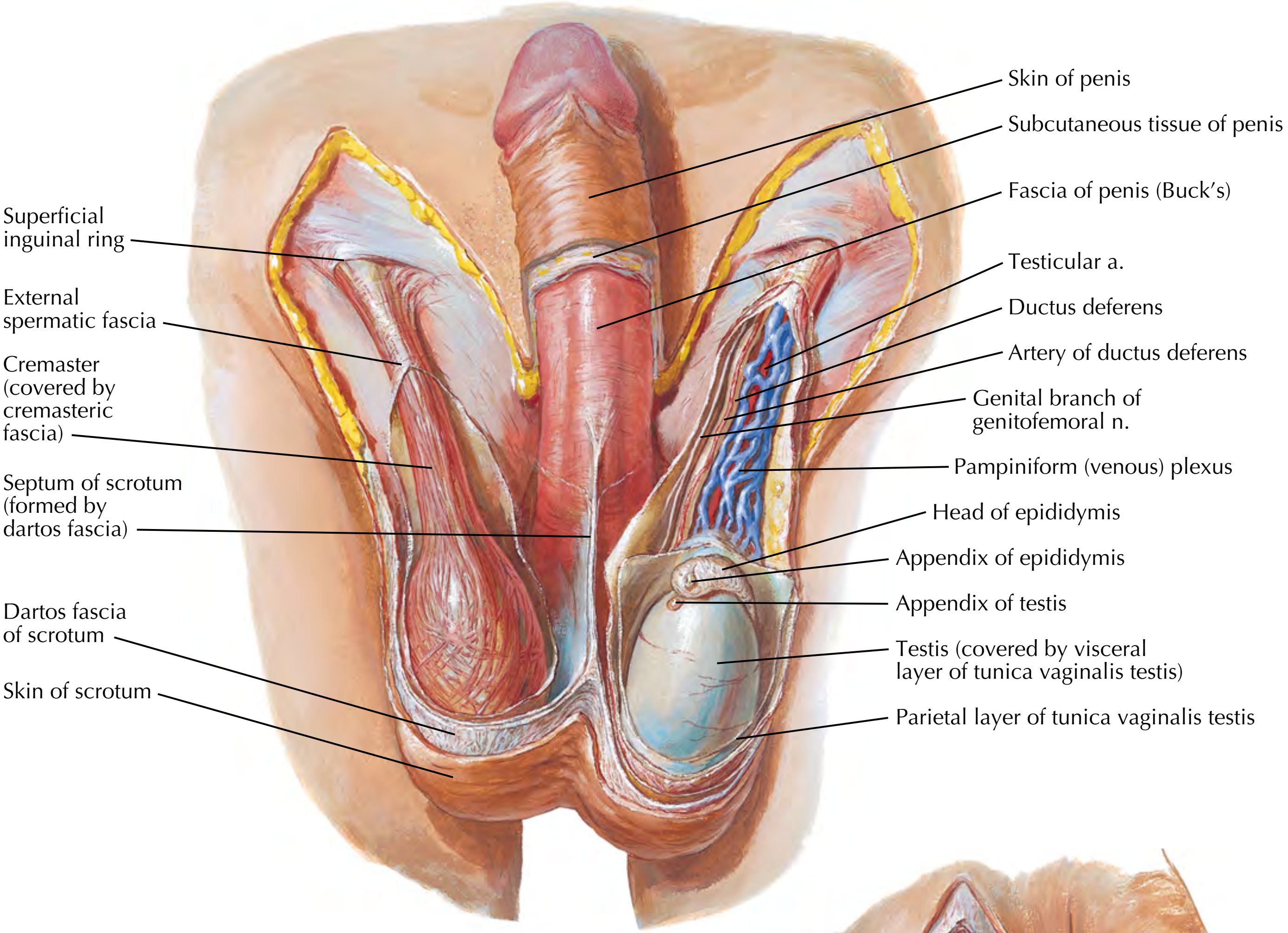
8 weeks
(22.5-mm crown–rump)

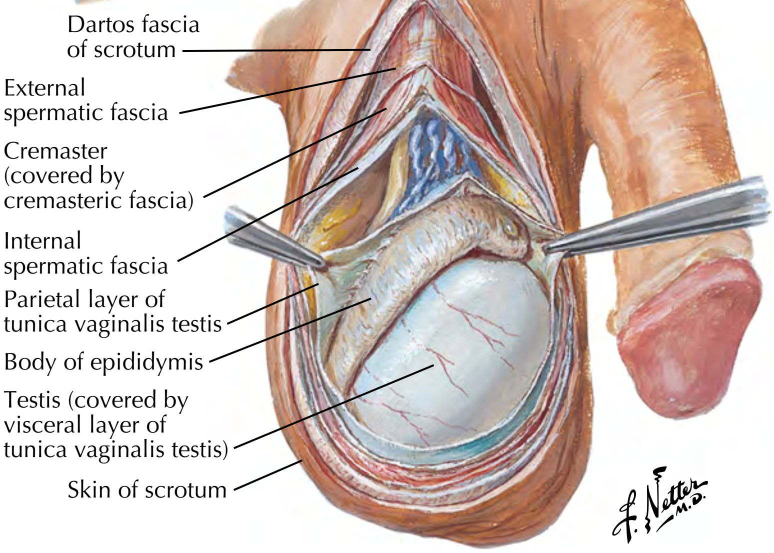
11 weeks
(43-mm crown–rump)

4 months
(107-mm crown–rump)

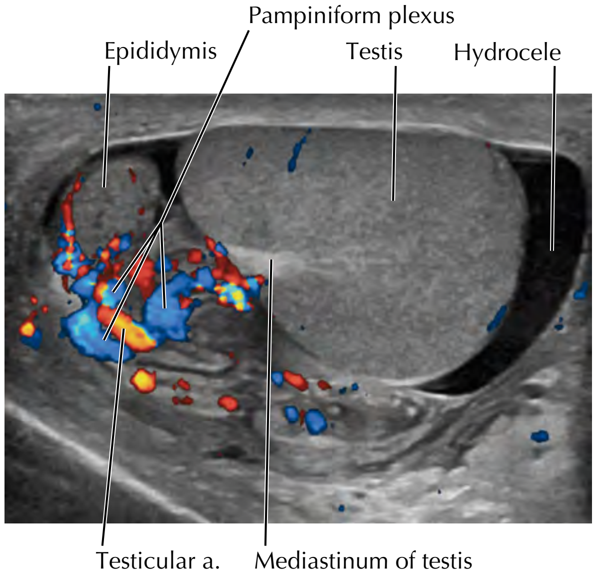
8 months
(26-cm crown–rump)

See also **Plates 343, 368**


Superficial inguinal ring
External spermatic fascia
Cremaster (covered by cremasteric fascia)
Septum of scrotum (formed by dartos fascia)
Dartos fascia of scrotum
Skin of scrotum
Skin of penis
Subcutaneous tissue of penis
Fascia of penis (Buck's)
Testicular a.
Ductus deferens
Artery of ductus deferens
Genital branch of genitofemoral n.
Pampiniform (venous) plexus
Head of epididymis
Appendix of epididymis
Appendix of testis
Testis (covered by visceral layer of tunica vaginalis testis)
Parietal layer of tunica vaginalis testis

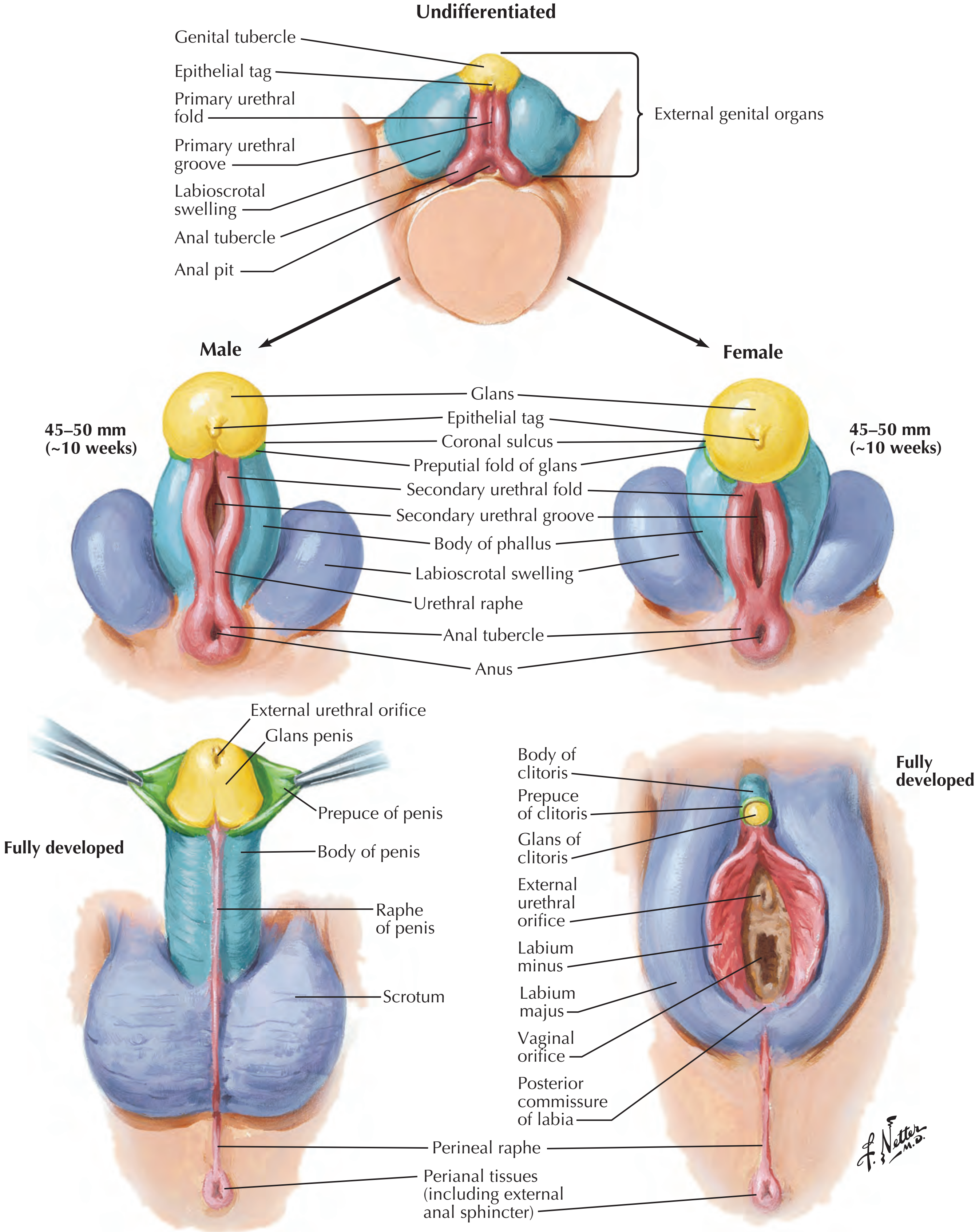

Dartos fascia of scrotum
External spermatic fascia
Cremaster (covered by cremasteric fascia)
Internal spermatic fascia
Parietal layer of tunica vaginalis testis
Body of epididymis
Testis (covered by visceral layer of tunica vaginalis testis)
Skin of scrotum

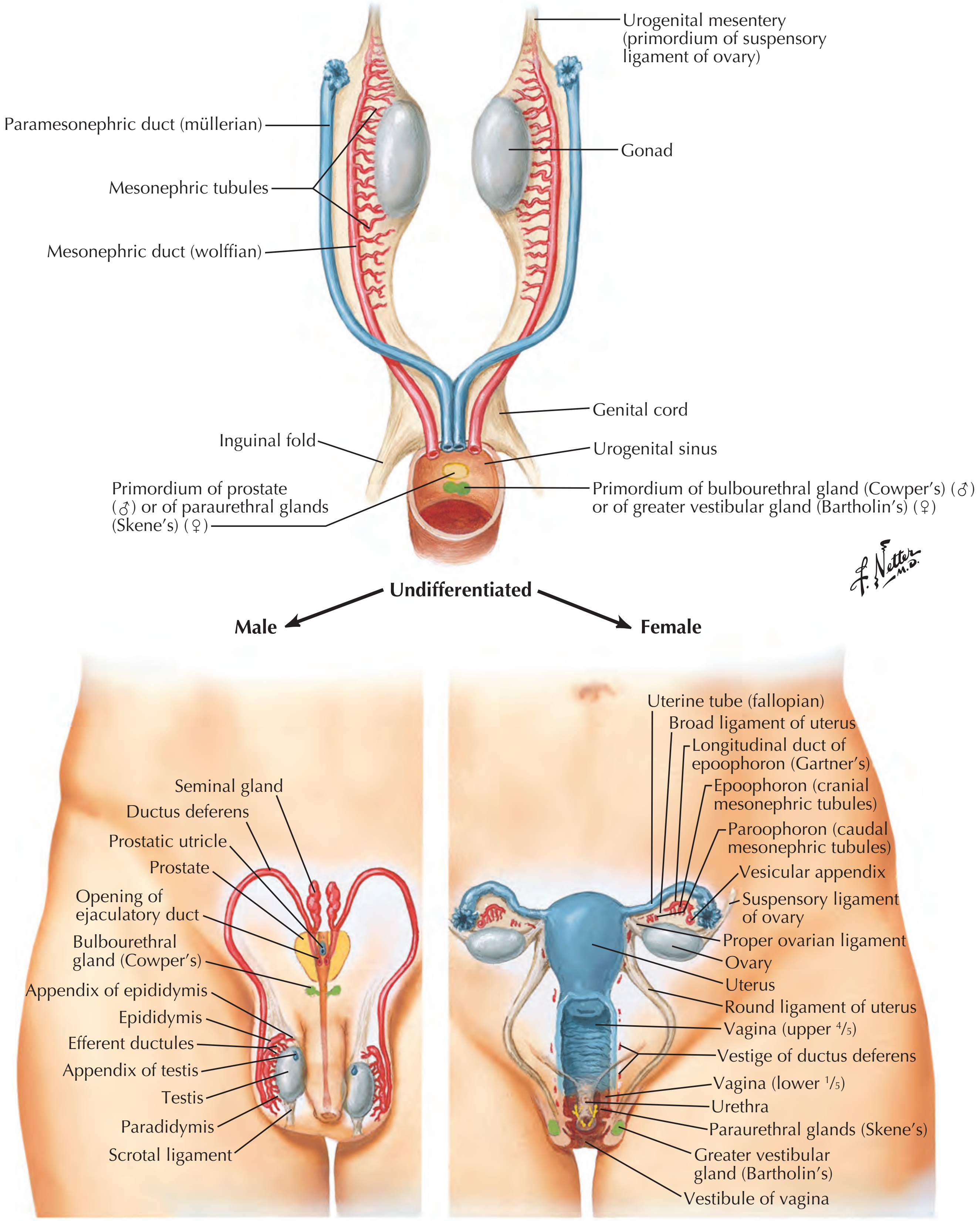
Color Doppler ultrasound: transverse view of testis


Pampiniform plexus
Epididymis
Testis
Hydrocele
Testicular a.
Mediastinum of testis

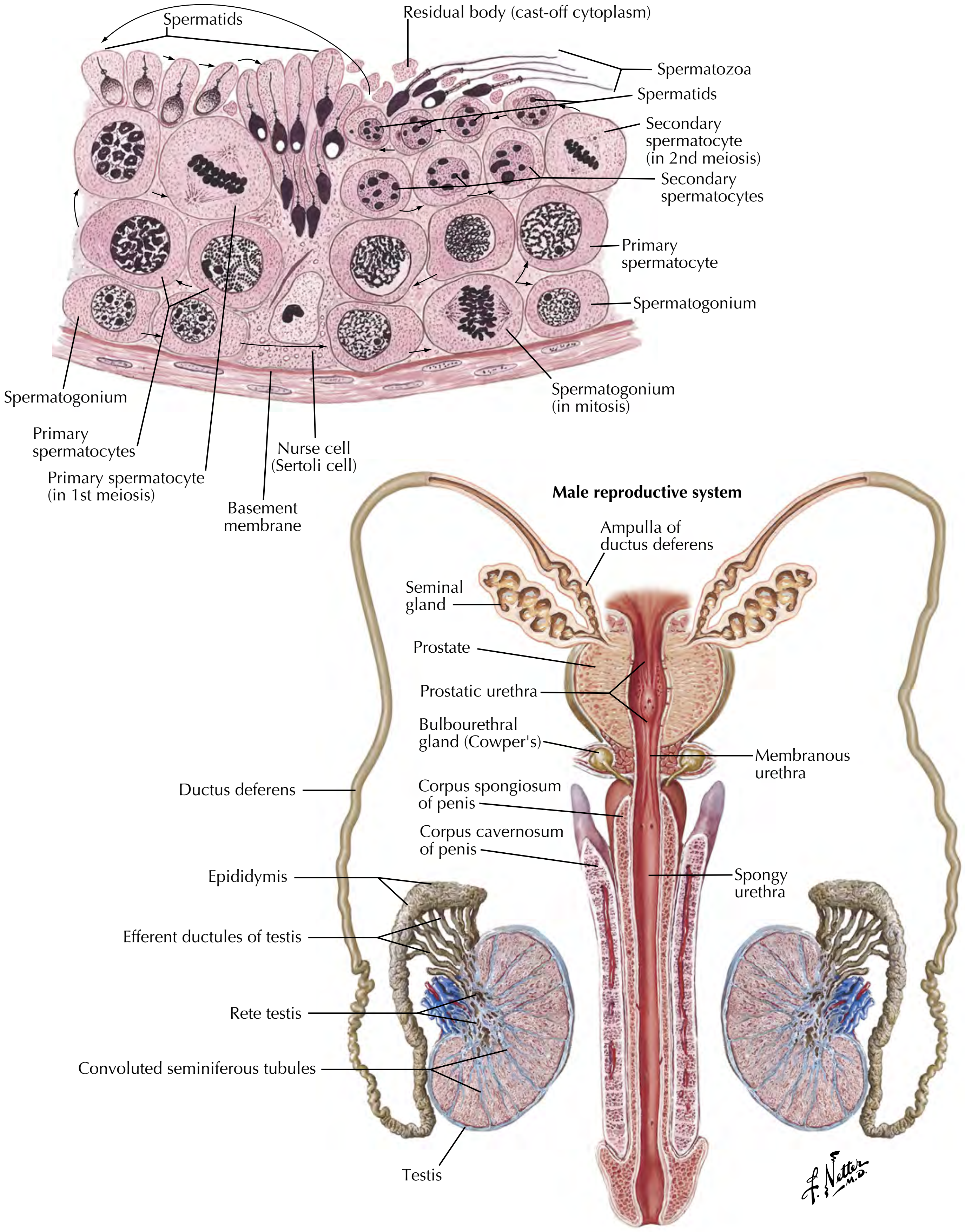
Homologues of External Genitalia

See also **Plates 377, 381**


Undifferentiated
Genital tubercle
Epithelial tag
Primary urethral fold
Primary urethral groove
Labioscrotal swelling
Anal tubercle
Anal pit
External genital organs
Male
Female
45–50 mm (~10 weeks)
45–50 mm (~10 weeks)
Glans
Epithelial tag
Coronal sulcus
Preputial fold of glans
Secondary urethral fold
Secondary urethral groove
Body of phallus
Labioscrotal swelling
Urethral raphe
Anal tubercle
Anus
External urethral orifice
Glans penis
Prepuce of penis
Fully developed
Body of penis
Raphe of penis
Scrotum
Body of clitoris
Prepuce of clitoris
Glans of clitoris
External urethral orifice
Labium minus
Labium majus
Vaginal orifice
Posterior commissure of labia
Fully developed
Perineal raphe
Perianal tissues (including external anal sphincter)


Urogenital mesentery (primordium of suspensory ligament of ovary)
Paramesonephric duct (müllerian)
Gonad
Mesonephric tubules
Mesonephric duct (wolffian)
Genital cord
Inguinal fold
Urogenital sinus
Primordium of prostate (♂) or of paraurethral glands (Skene's) (♀)
Primordium of bulbourethral gland (Cowper's) (♂) or of greater vestibular gland (Bartholin's) (♀)
Undifferentiated
Male
Female
Seminal gland
Ductus deferens
Prostatic utricle
Prostate
Opening of ejaculatory duct
Bulbourethral gland (Cowper's)
Appendix of epididymis
Epididymis
Efferent ductules
Appendix of testis
Testis
Paradidymis
Scrotal ligament
Uterine tube (fallopian)
Broad ligament of uterus
Longitudinal duct of epoophoron (Gartner's)
Epoophoron (cranial mesonephric tubules)
Paroophoron (caudal mesonephric tubules)
Vesicular appendix
Suspensory ligament of ovary
Proper ovarian ligament
Ovary
Uterus
Round ligament of uterus
Vagina (upper 4/5)
Vestige of ductus deferens
Vagina (lower 1/5)
Urethra
Paraurethral glands (Skene's)
Greater vestibular gland (Bartholin's)
Vestibule of vagina

Testes

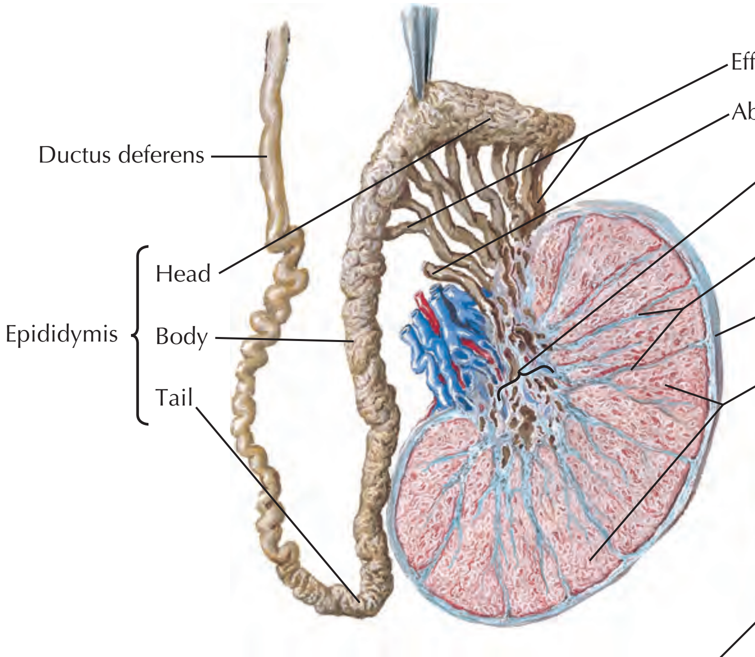


Seminiferous epithelium: spermatogenesis

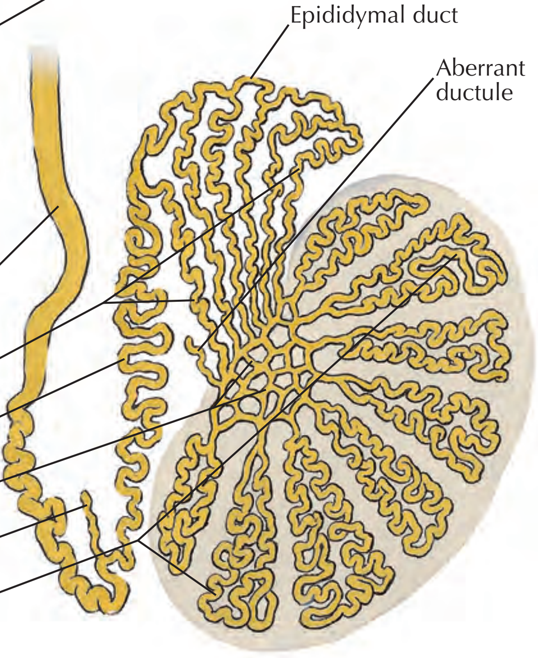
Spermatids
Residual body (cast-off cytoplasm)
Spermatozoa
Spermatids
Secondary spermatocyte (in 2nd meiosis)
Secondary spermatocytes
Primary spermatocyte
Spermatogonium
Spermatogonium (in mitosis)
Spermatogonium
Primary spermatocytes
Primary spermatocyte (in 1st meiosis)
Nurse cell (Sertoli cell)
Basement membrane

Male reproductive system

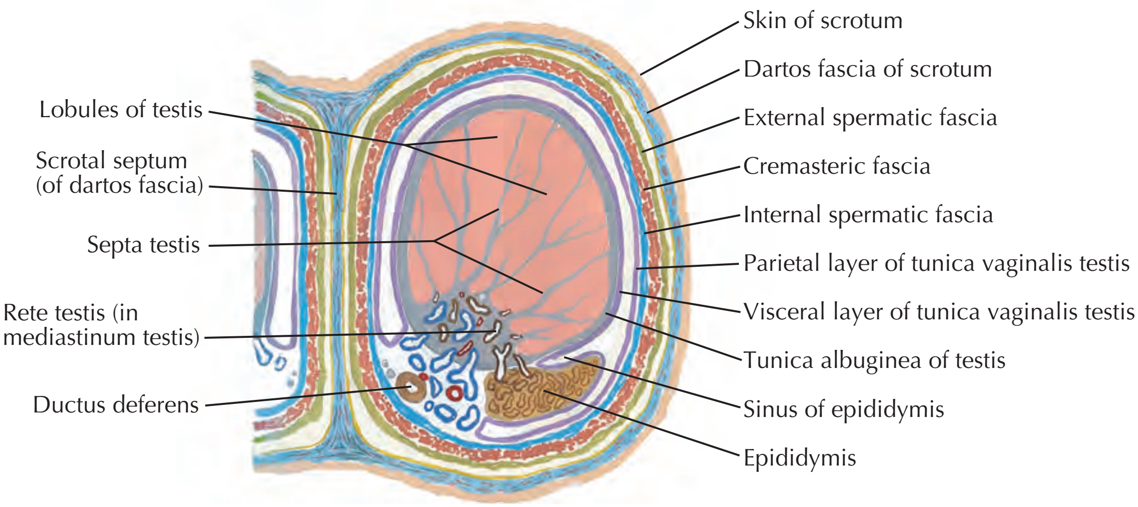
Ampulla of ductus deferens
Seminal gland
Prostate
Prostatic urethra
Bulbourethral gland (Cowper's)
Membranous urethra
Ductus deferens
Corpus spongiosum of penis
Corpus cavernosum of penis
Spongy urethra
Epididymis
Efferent ductules of testis
Rete testis
Convoluted seminiferous tubules
Testis


Efferent ductules
Aberrant ductule (vestigial mesonephric tubule)
Ductus deferens
Rete testis (in mediastinum testis)
Septa testis
Head
Tunica albuginea of testis
Epididymis
Body
Lobules of testis
Tail

Coronal section


Epididymal duct
Aberrant ductule
Ductus deferens
Efferent ductules
Epididymal duct
Rete testis (in mediastinum testis)
Aberrant ductule
Convoluted seminiferous tubules

Schema


Skin of scrotum
Dartos fascia of scrotum
Lobules of testis
External spermatic fascia
Cremasteric fascia
Scrotal septum (of dartos fascia)
Internal spermatic fascia
Septa testis
Parietal layer of tunica vaginalis testis
Visceral layer of tunica vaginalis testis
Rete testis (in mediastinum testis)
Tunica albuginea of testis
Sinus of epididymis
Ductus deferens
Epididymis

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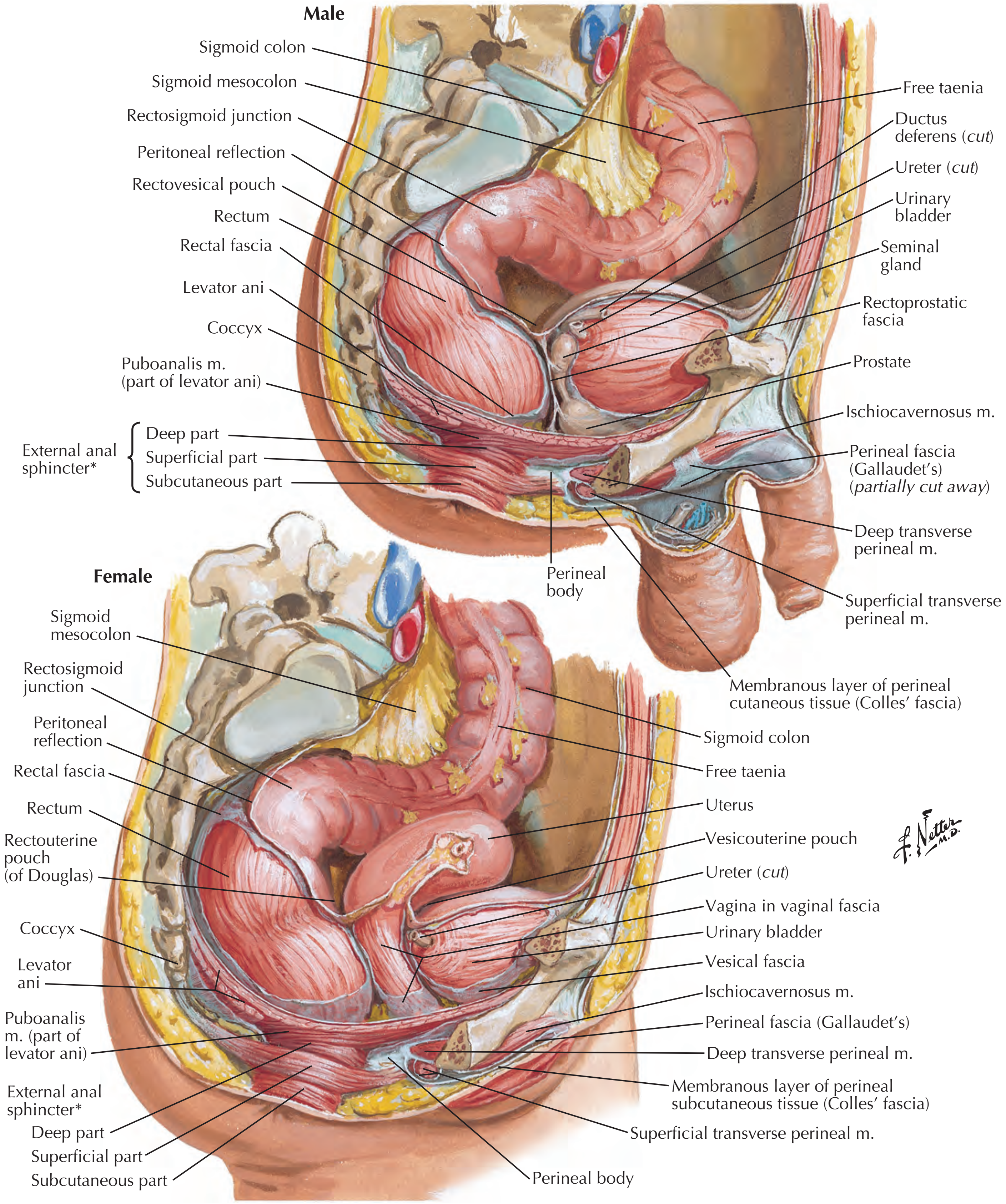
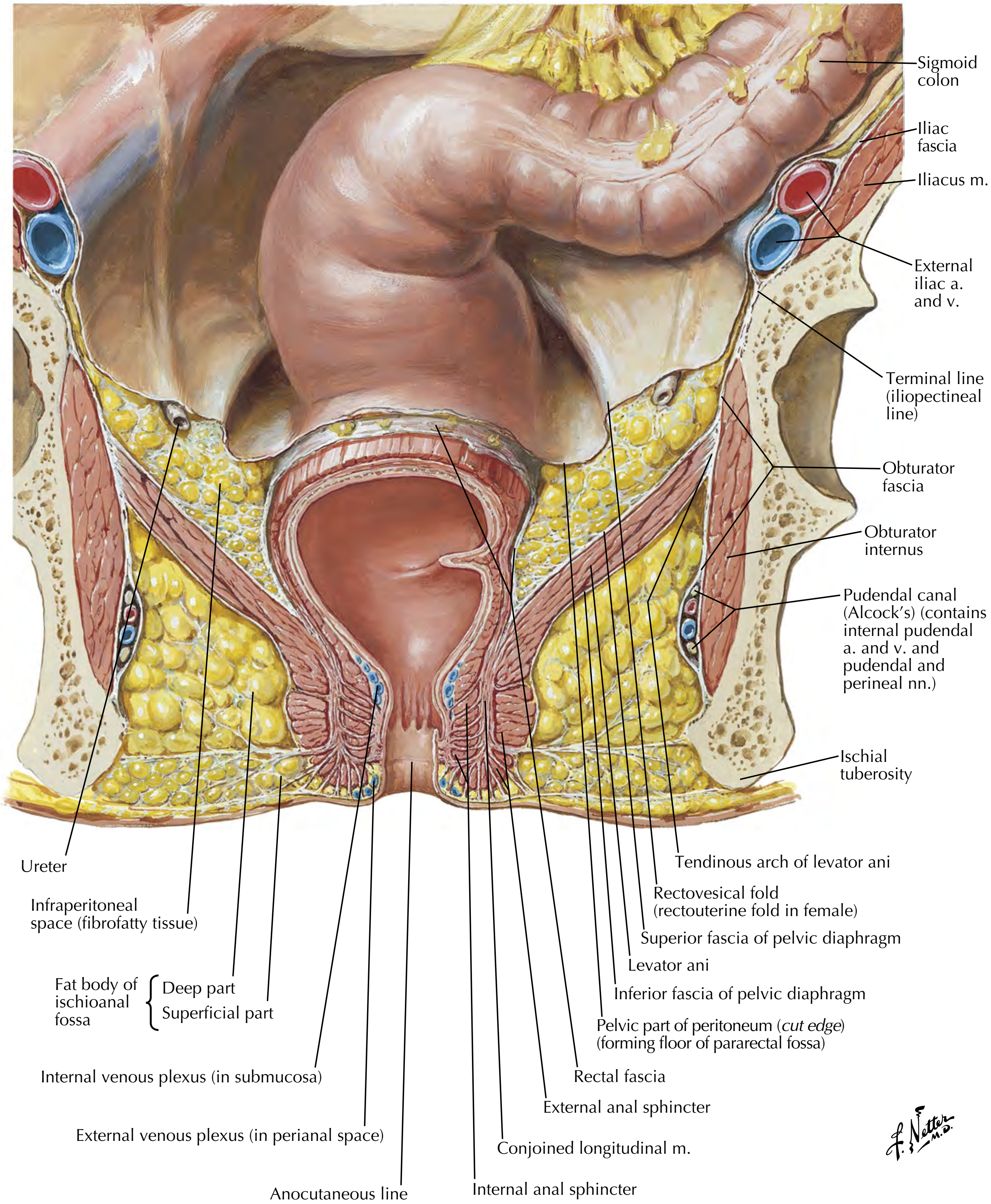
Horizontal section through scrotum and testis

Rectum in Situ: Female and Male

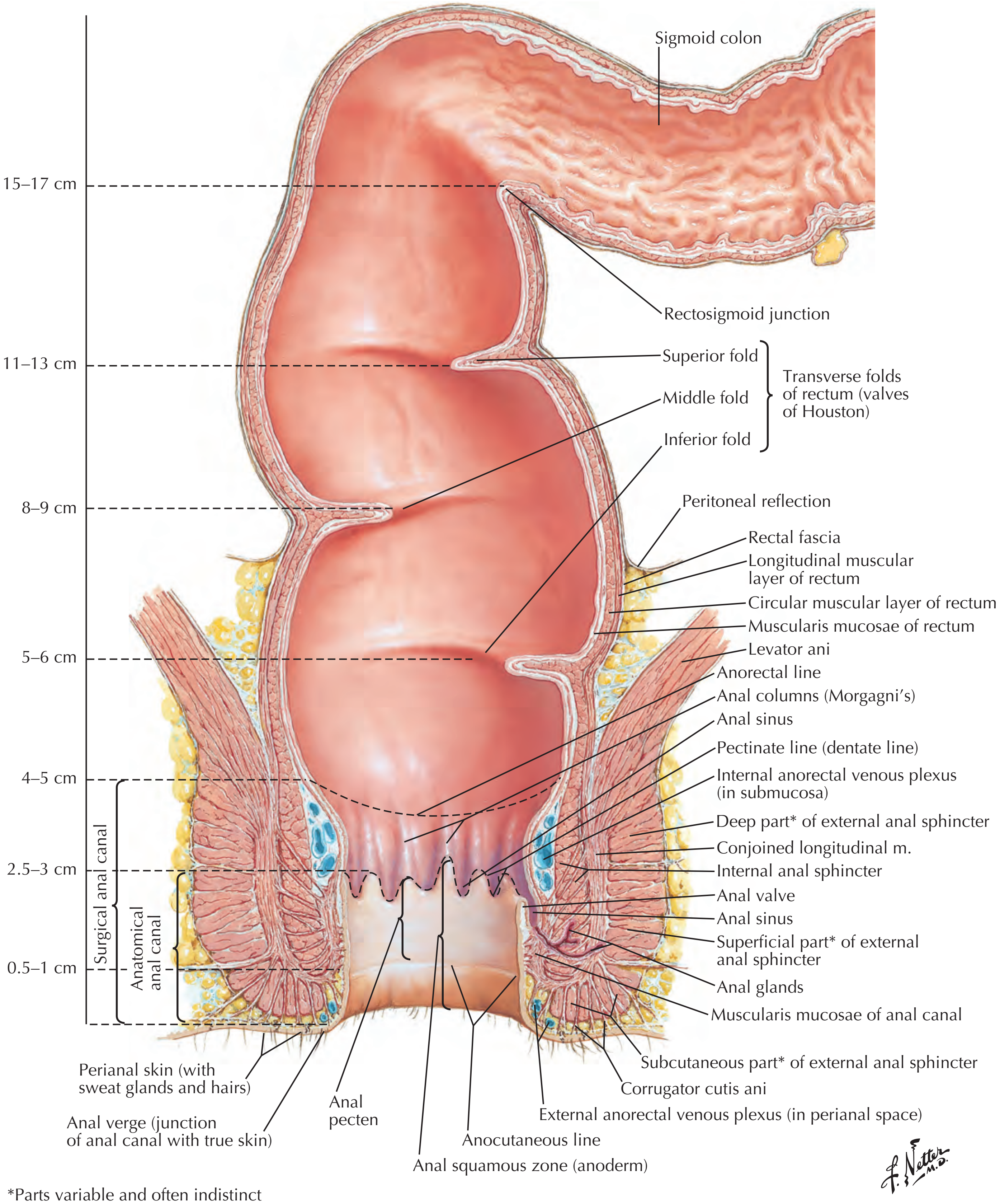

Male
Sigmoid colon
Sigmoid mesocolon
Rectosigmoid junction
Peritoneal reflection
Rectovesical pouch
Rectum
Rectal fascia
Levator ani
Coccyx
Puboanalis m. (part of levator ani)
External anal sphincter*
Deep part
Superficial part
Subcutaneous part
Free taenia
Ductus deferens (*cut*)
Ureter (*cut*)
Urinary bladder
Seminal gland
Rectoprostatic fascia
Prostate
Ischiocavernosus m.
Perineal fascia (Gallaudet's) (*partially cut away*)
Deep transverse perineal m.
Perineal body
Superficial transverse perineal m.
Membranous layer of perineal cutaneous tissue (Colles' fascia)
Female
Sigmoid mesocolon
Rectosigmoid junction
Peritoneal reflection
Rectal fascia
Rectum
Rectouterine pouch (of Douglas)
Coccyx
Levator ani
Puboanalis m. (part of levator ani)
External anal sphincter*
Deep part
Superficial part
Subcutaneous part
Sigmoid colon
Free taenia
Uterus
Vesicouterine pouch
Ureter (*cut*)
Vagina in vaginal fascia
Urinary bladder
Vesical fascia
Ischiocavernosus m.
Perineal fascia (Gallaudet's)
Deep transverse perineal m.
Membranous layer of perineal subcutaneous tissue (Colles' fascia)
Superficial transverse perineal m.
Perineal body

*Parts variable and often indistinct

See also Plate 412


Sigmoid colon
Iliac fascia
Iliacus m.
External iliac a. and v.
Terminal line (iliopectineal line)
Obturator fascia
Obturator internus
Pudendal canal (Alcock's) (contains internal pudendal a. and v. and pudendal and perineal nn.)
Ischial tuberosity
Tendinous arch of levator ani
Rectovesical fold (rectouterine fold in female)
Superior fascia of pelvic diaphragm
Levator ani
Inferior fascia of pelvic diaphragm
Pelvic part of peritoneum (*cut edge*) (forming floor of pararectal fossa)
Rectal fascia
External anal sphincter
Conjoined longitudinal m.
Internal anal sphincter
Anocutaneous line
External venous plexus (in perianal space)
Internal venous plexus (in submucosa)
Fat body of ischioanal fossa
Deep part
Superficial part
Infraperitoneal space (fibrofatty tissue)
Ureter

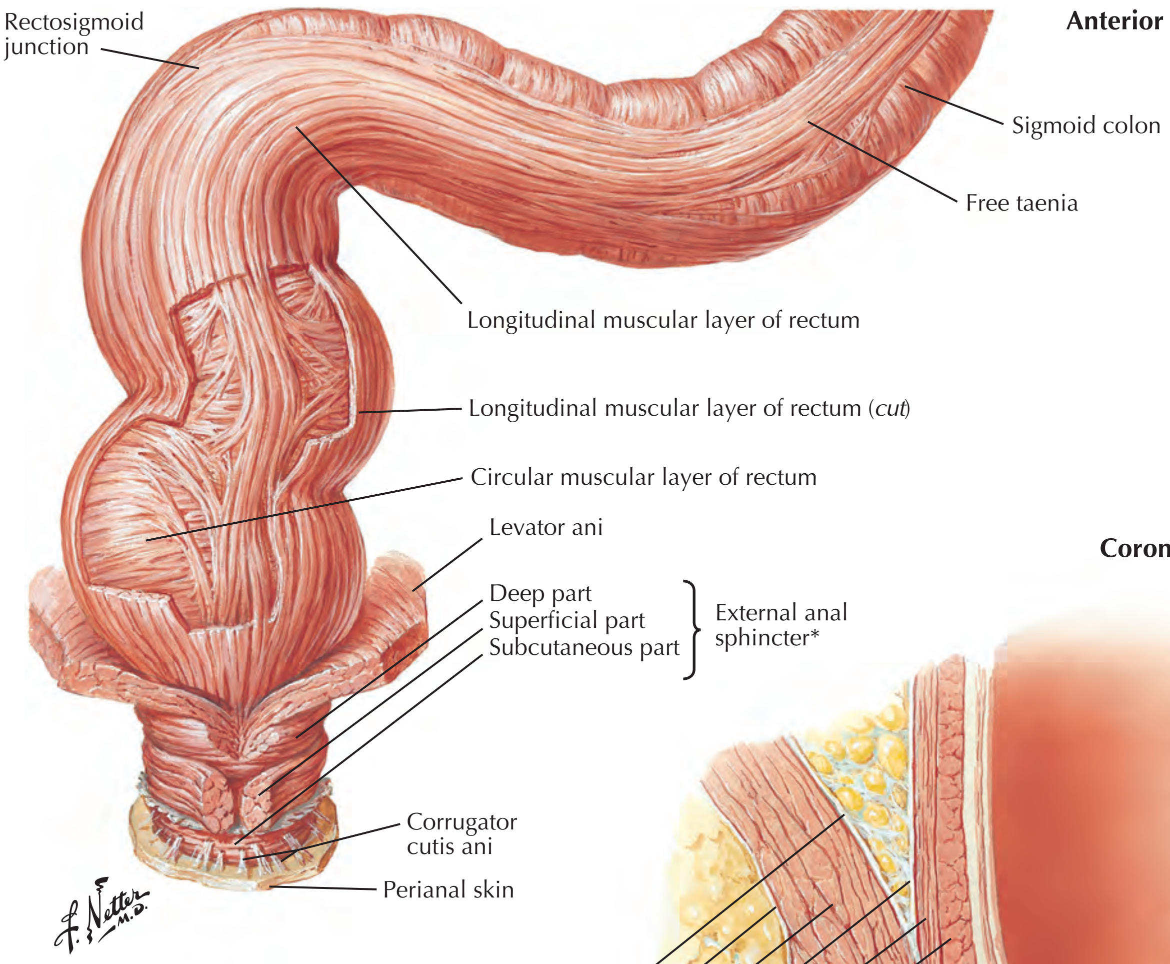
F. Netter M.D.


Sigmoid colon
Rectosigmoid junction
Superior fold
Middle fold
Inferior fold
Transverse folds of rectum (valves of Houston)
Peritoneal reflection
Rectal fascia
Longitudinal muscular layer of rectum
Circular muscular layer of rectum
Muscularis mucosae of rectum
Levator ani
Anorectal line
Anal columns (Morgagni's)
Anal sinus
Pectinate line (dentate line)
Internal anorectal venous plexus (in submucosa)
Deep part* of external anal sphincter
Conjoined longitudinal m.
Internal anal sphincter
Anal valve
Anal sinus
Superficial part* of external anal sphincter
Anal glands
Muscularis mucosae of anal canal
Subcutaneous part* of external anal sphincter
Corrugator cutis ani
External anorectal venous plexus (in perianal space)
Anocutaneous line
Anal squamous zone (anoderm)
Anal pecten
Anal verge (junction of anal canal with true skin)
Perianal skin (with sweat glands and hairs)
15–17 cm
11–13 cm
8–9 cm
5–6 cm
4–5 cm
2.5–3 cm
0.5–1 cm
Surgical anal canal
Anatomical anal canal

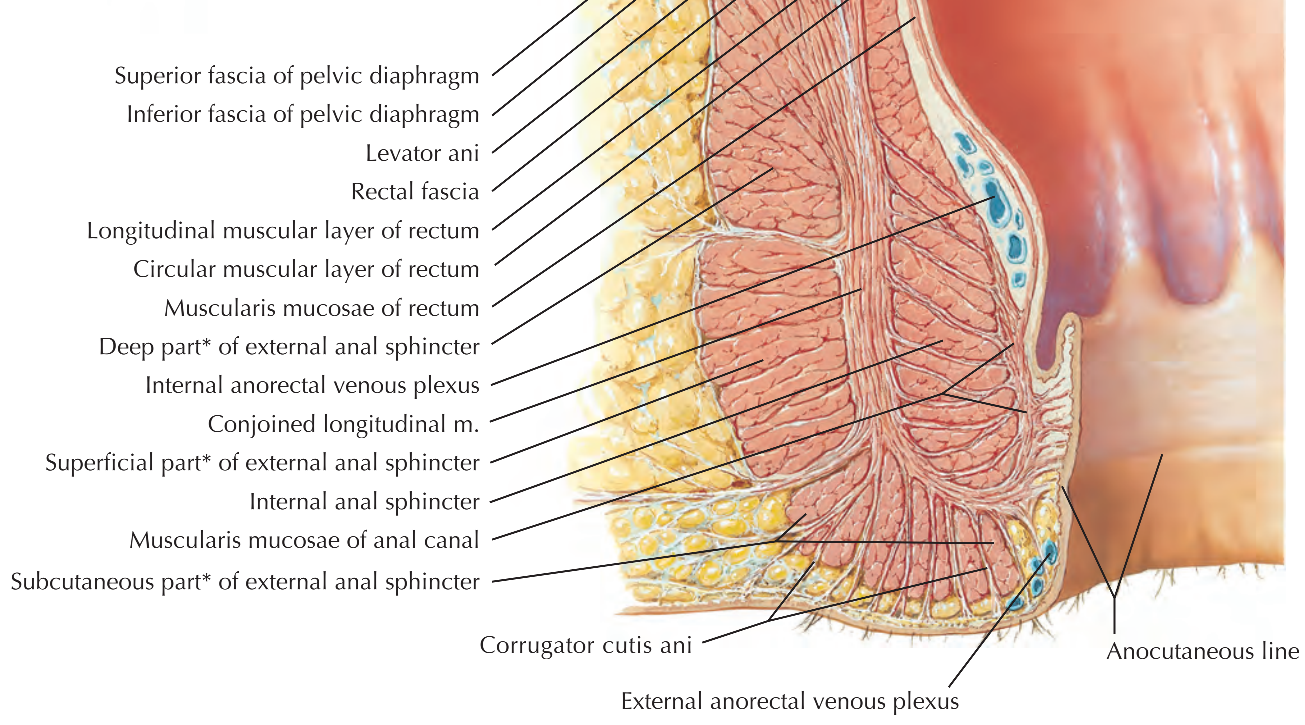
*Parts variable and often indistinct

See also **Plates 400, 401**

Anterior view


Rectosigmoid junction
Sigmoid colon
Free taenia
Longitudinal muscular layer of rectum
Longitudinal muscular layer of rectum (*cut*)
Circular muscular layer of rectum
Levator ani
Deep part
Superficial part
Subcutaneous part
External anal sphincter*
Corrugator cutis ani
Perianal skin
F. Netter M.D.

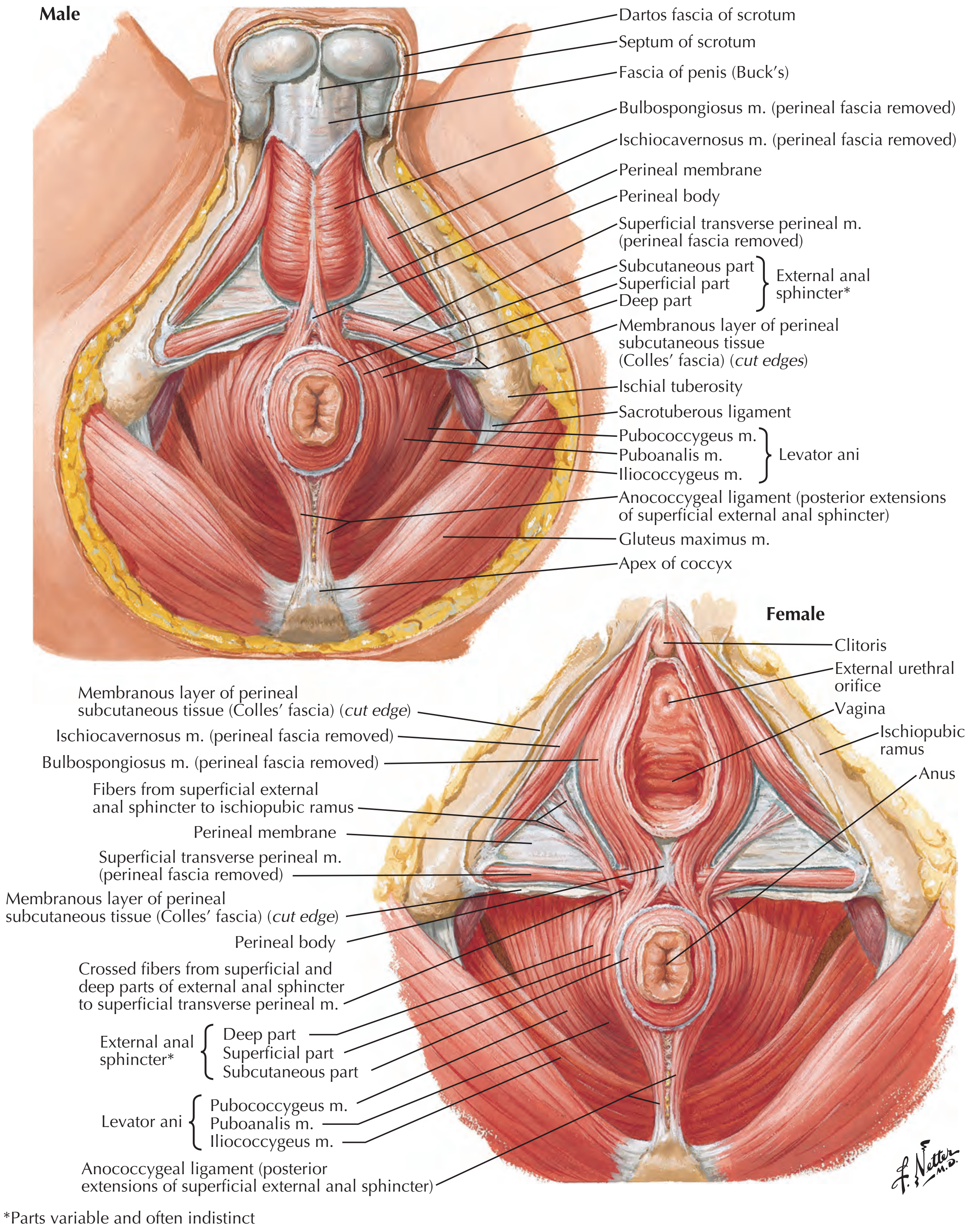
Coronal section


Superior fascia of pelvic diaphragm
Inferior fascia of pelvic diaphragm
Levator ani
Rectal fascia
Longitudinal muscular layer of rectum
Circular muscular layer of rectum
Muscularis mucosae of rectum
Deep part* of external anal sphincter
Internal anorectal venous plexus
Conjoined longitudinal m.
Superficial part* of external anal sphincter
Internal anal sphincter
Muscularis mucosae of anal canal
Subcutaneous part* of external anal sphincter
Corrugator cutis ani
External anorectal venous plexus
Anocutaneous line

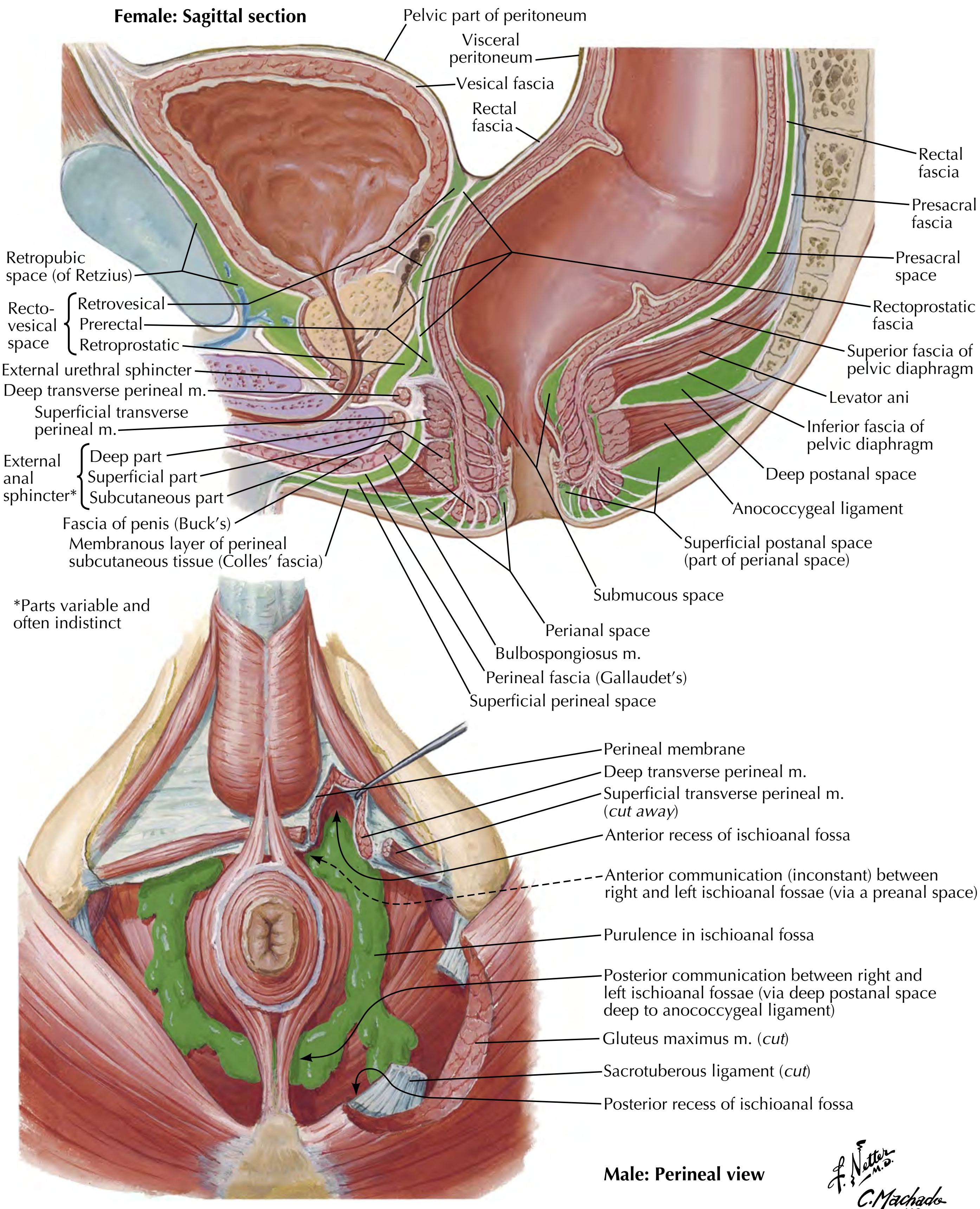
*Parts variable and often indistinct

External Anal Sphincter: Perineal Views

See also **Plates 379, 384**

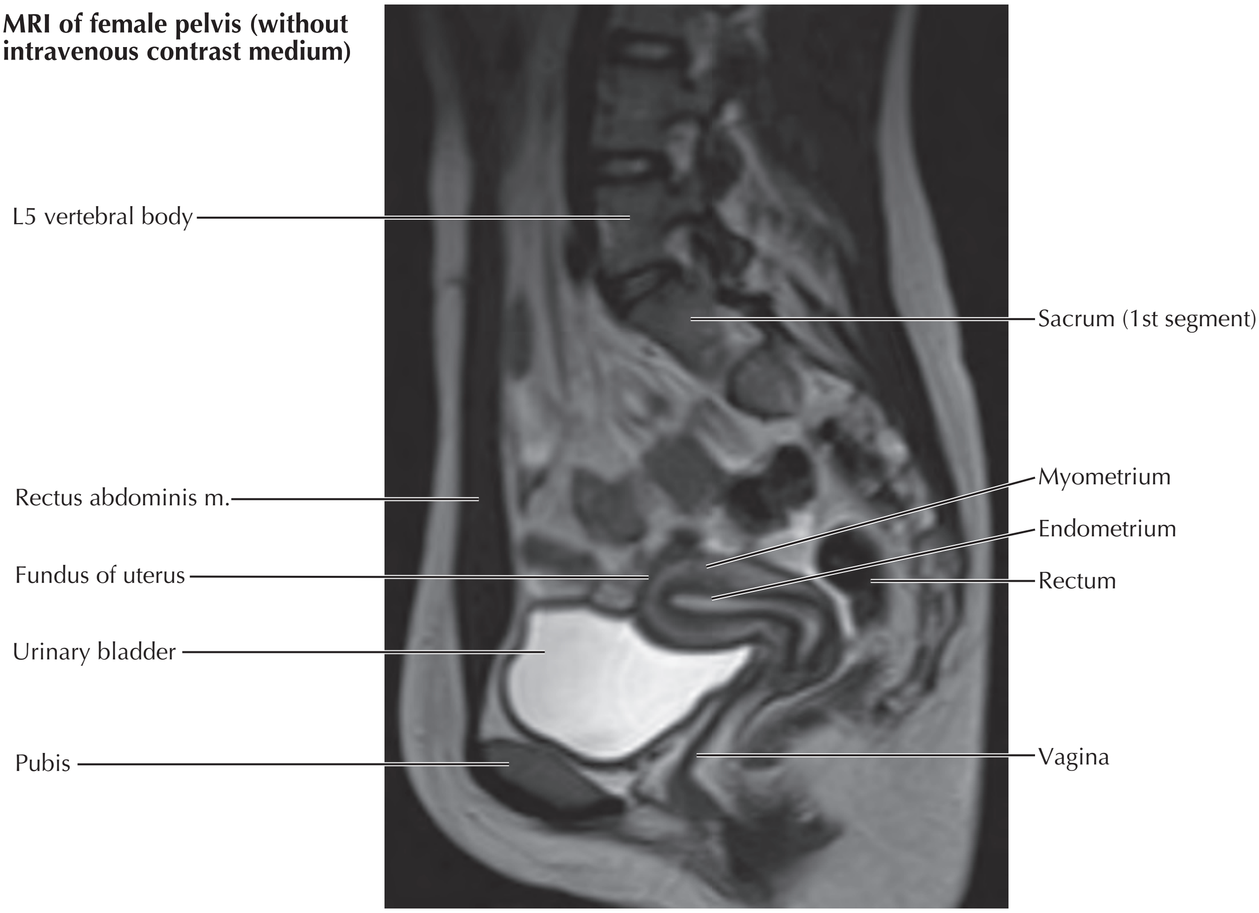

Male
Dartos fascia of scrotum
Septum of scrotum
Fascia of penis (Buck's)
Bulbospongiosus m. (perineal fascia removed)
Ischiocavernosus m. (perineal fascia removed)
Perineal membrane
Perineal body
Superficial transverse perineal m. (perineal fascia removed)
Subcutaneous part
Superficial part
Deep part
External anal sphincter*
Membranous layer of perineal subcutaneous tissue (Colles' fascia) (*cut edges*)
Ischial tuberosity
Sacrotuberous ligament
Pubococcygeus m.
Puboanalis m.
Iliococcygeus m.
Levator ani
Anococcygeal ligament (posterior extensions of superficial external anal sphincter)
Gluteus maximus m.
Apex of coccyx
Female
Clitoris
External urethral orifice
Vagina
Ischiopubic ramus
Anus
Membranous layer of perineal subcutaneous tissue (Colles' fascia) (*cut edge*)
Ischiocavernosus m. (perineal fascia removed)
Bulbospongiosus m. (perineal fascia removed)
Fibers from superficial external anal sphincter to ischiopubic ramus
Perineal membrane
Superficial transverse perineal m. (perineal fascia removed)
Membranous layer of perineal subcutaneous tissue (Colles' fascia) (*cut edge*)
Perineal body
Crossed fibers from superficial and deep parts of external anal sphincter to superficial transverse perineal m.
External anal sphincter*
Deep part
Superficial part
Subcutaneous part
Levator ani
Pubococcygeus m.
Puboanalis m.
Iliococcygeus m.
Anococcygeal ligament (posterior extensions of superficial external anal sphincter)

*Parts variable and often indistinct

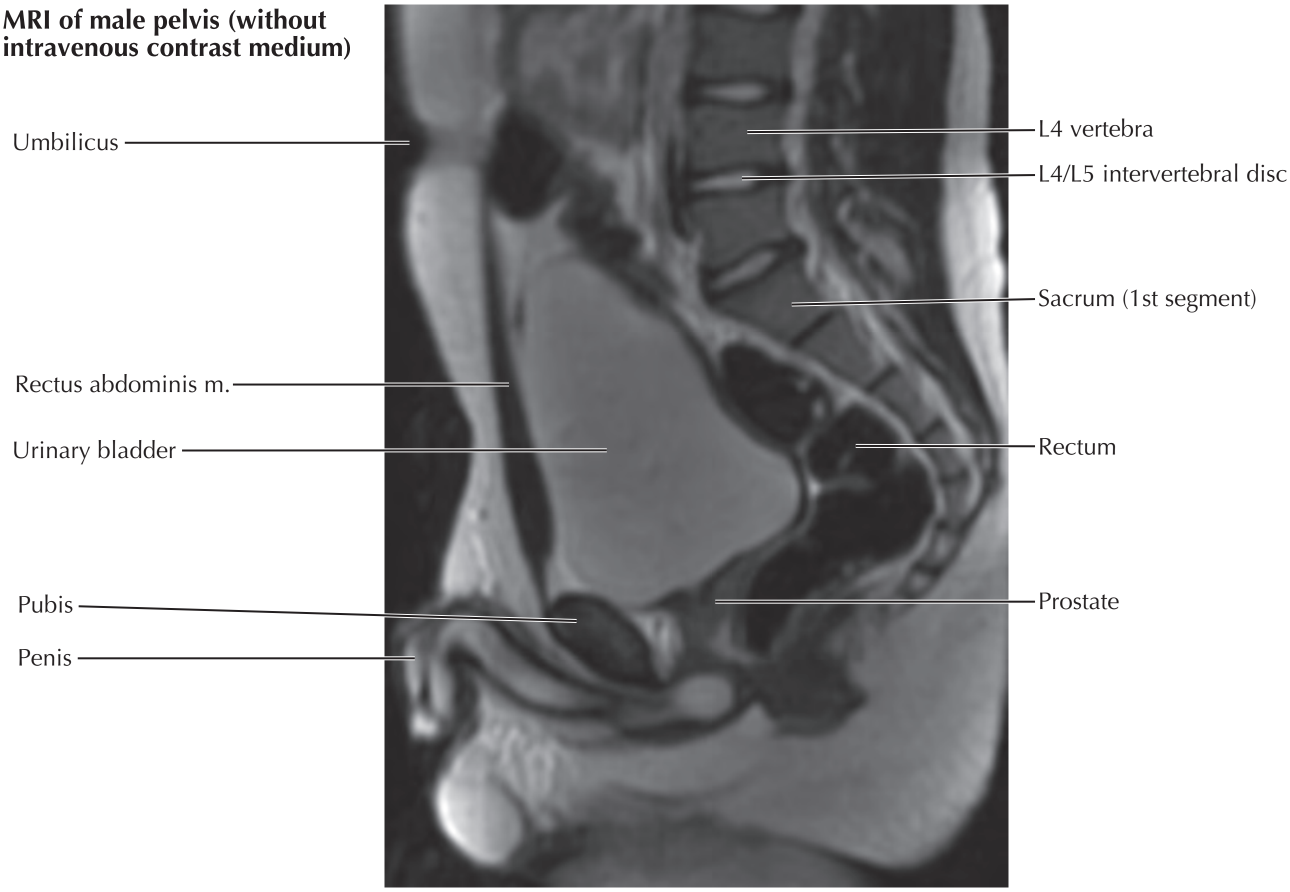

Female: Sagittal section
Pelvic part of peritoneum
Visceral peritoneum
Vesical fascia
Rectal fascia
Rectal fascia
Presacral fascia
Presacral space
Retropubic space (of Retzius)
Recto-vesical space
Retrovesical
Prerectal
Retroprostatic
Rectoprostatic fascia
Superior fascia of pelvic diaphragm
Levator ani
External urethral sphincter
Deep transverse perineal m.
Superficial transverse perineal m.
Inferior fascia of pelvic diaphragm
External anal sphincter*
Deep part
Superficial part
Subcutaneous part
Deep postanal space
Anococcygeal ligament
Fascia of penis (Buck's)
Membranous layer of perineal subcutaneous tissue (Colles' fascia)
Superficial postanal space (part of perianal space)
Submucous space
*Parts variable and often indistinct
Perianal space
Bulbospongiosus m.
Perineal fascia (Gallaudet's)
Superficial perineal space
Perineal membrane
Deep transverse perineal m.
Superficial transverse perineal m. (cut away)
Anterior recess of ischioanal fossa
Anterior communication (inconstant) between right and left ischioanal fossae (via a preanal space)
Purulence in ischioanal fossa
Posterior communication between right and left ischioanal fossae (via deep postanal space deep to anococcygeal ligament)
Gluteus maximus m. (cut)
Sacrotuberous ligament (cut)
Posterior recess of ischioanal fossa
Male: Perineal view
F. Netter M.D.
C. Machado M.D.

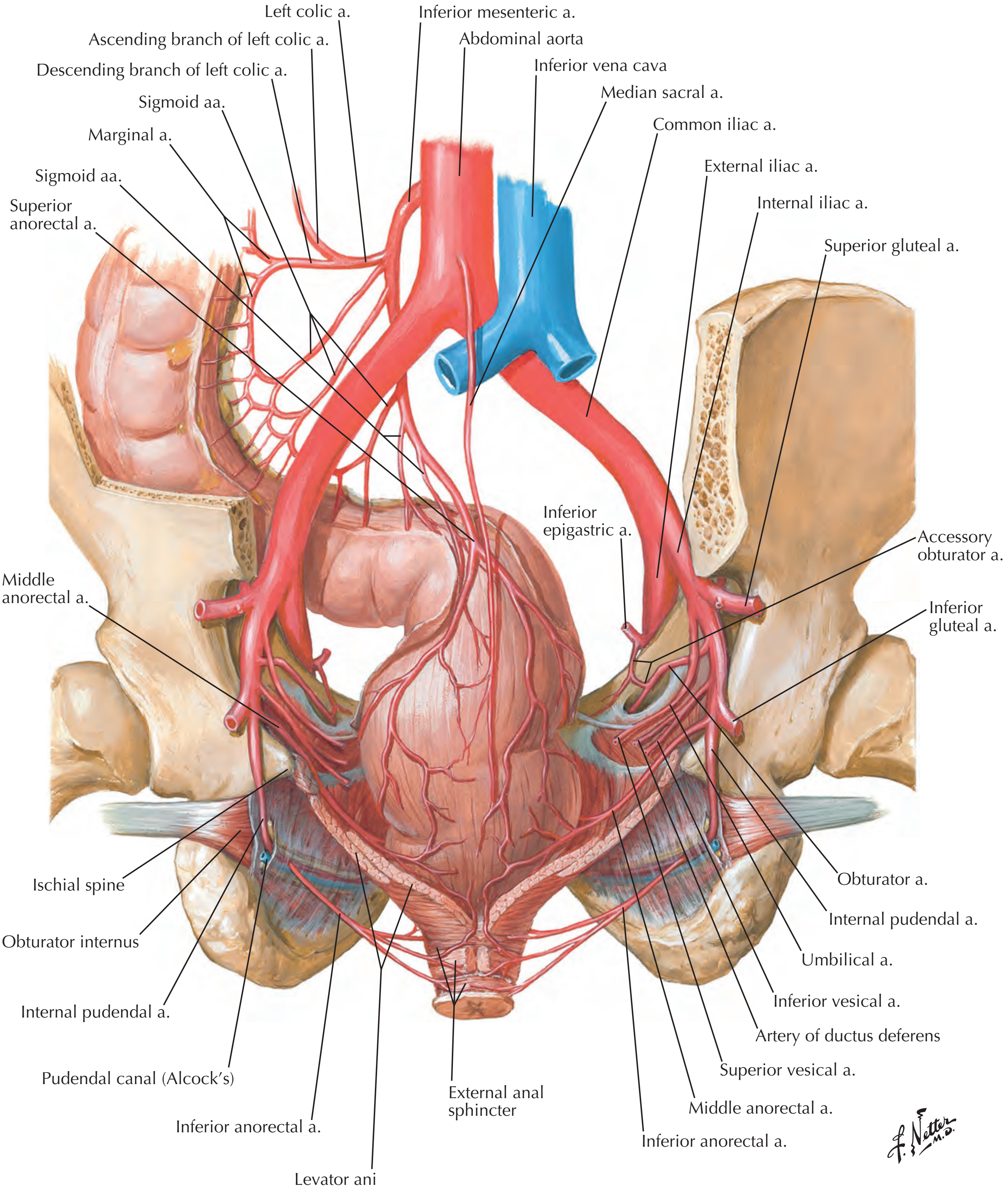
Spread of perineal abscess in perineal spaces

MRI of female pelvis (without intravenous contrast medium)

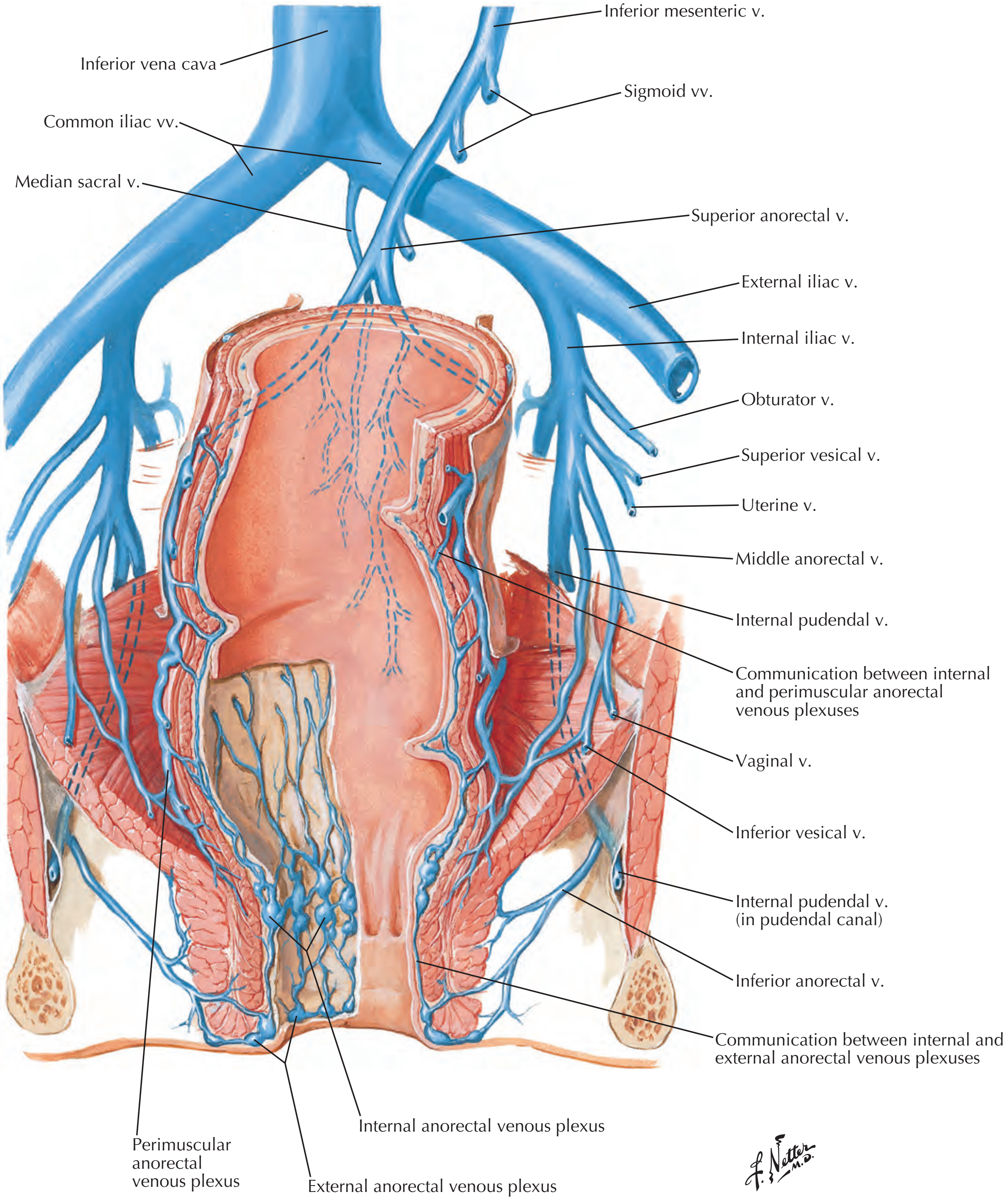

L5 vertebral body
Sacrum (1st segment)
Rectus abdominis m.
Myometrium
Endometrium
Fundus of uterus
Rectum
Urinary bladder
Pubis
Vagina

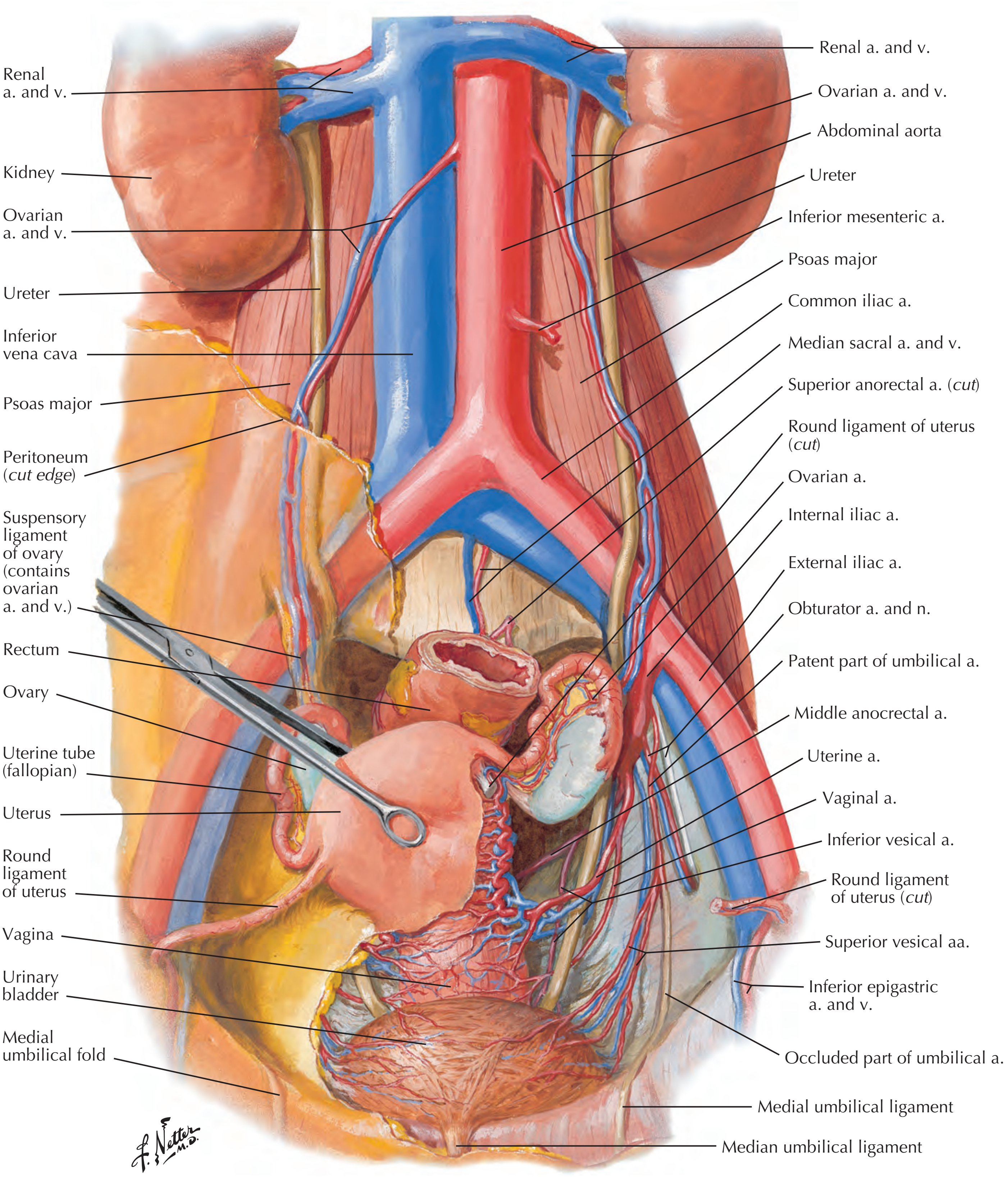
MRI of male pelvis (without intravenous contrast medium)

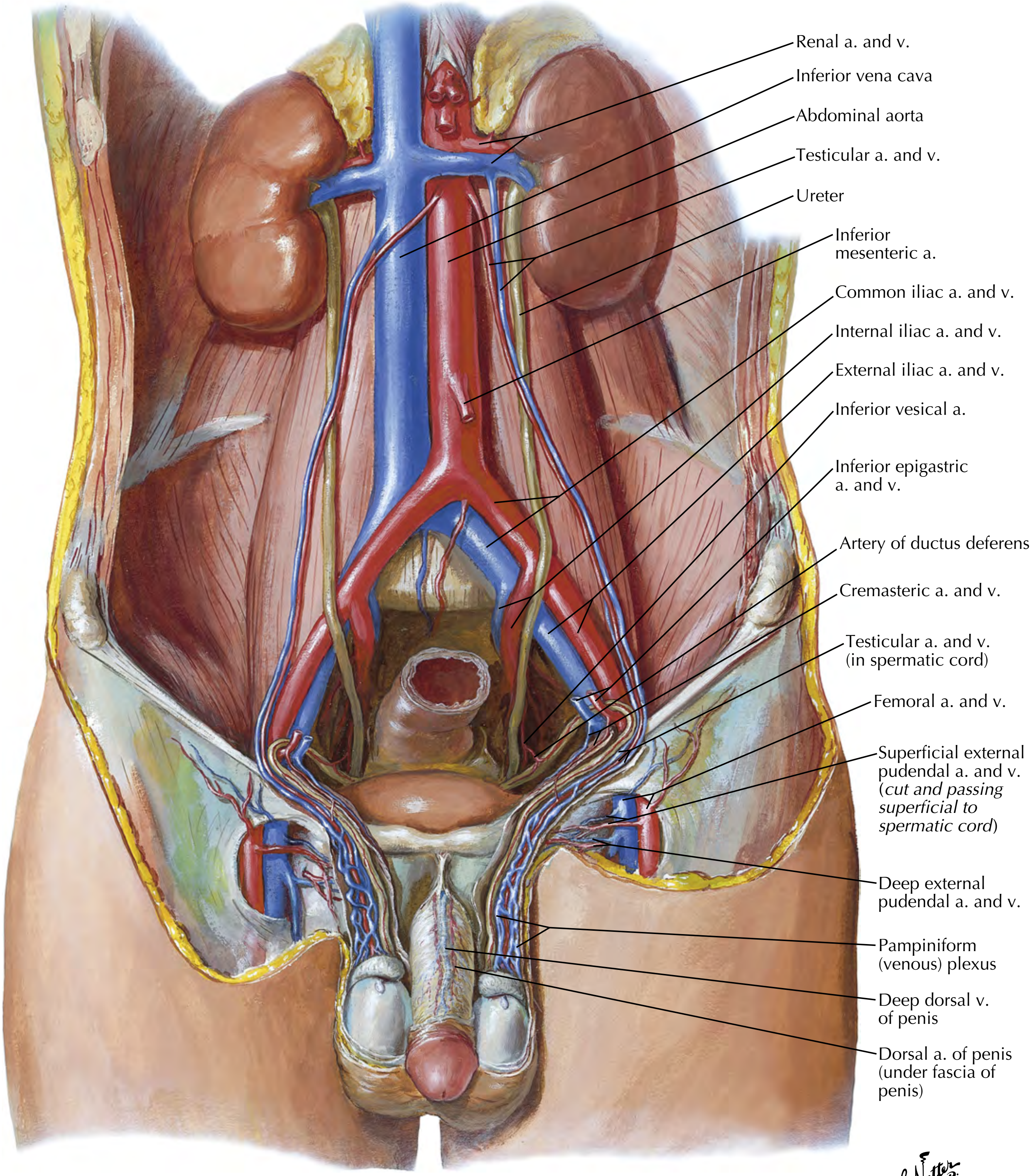

Umbilicus
L4 vertebra
L4/L5 intervertebral disc
Sacrum (1st segment)
Rectus abdominis m.
Urinary bladder
Rectum
Prostate
Pubis
Penis

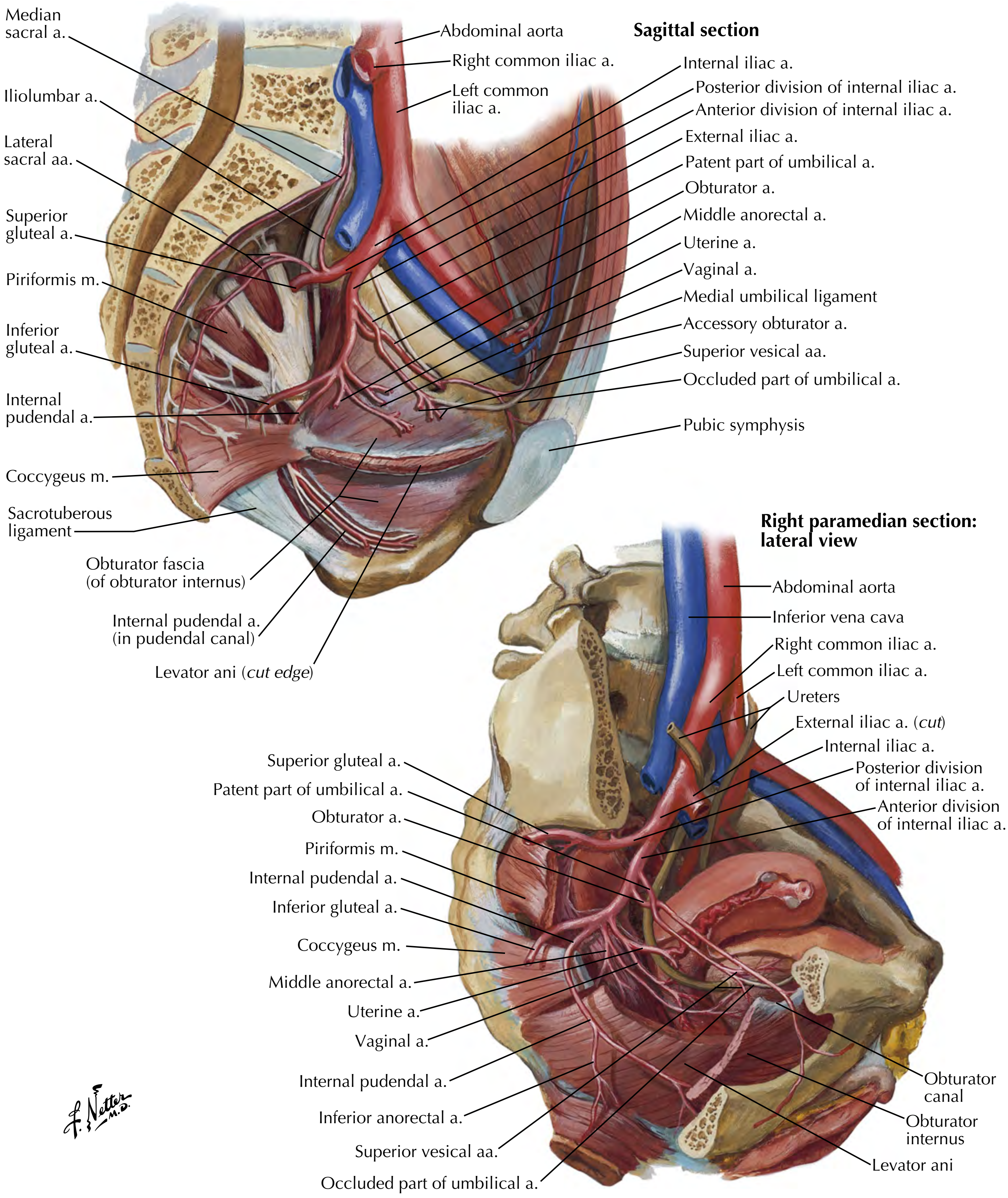

Left colic a.
Inferior mesenteric a.
Ascending branch of left colic a.
Abdominal aorta
Descending branch of left colic a.
Inferior vena cava
Median sacral a.
Sigmoid aa.
Common iliac a.
Marginal a.
External iliac a.
Sigmoid aa.
Internal iliac a.
Superior anorectal a.
Superior gluteal a.
Inferior epigastric a.
Accessory obturator a.
Middle anorectal a.
Inferior gluteal a.
Ischial spine
Obturator a.
Obturator internus
Internal pudendal a.
Umbilical a.
Internal pudendal a.
Inferior vesical a.
Artery of ductus deferens
Pudendal canal (Alcock's)
Superior vesical a.
External anal sphincter
Middle anorectal a.
Inferior anorectal a.
Inferior anorectal a.
Levator ani
F. Netter M.D.

Veins of Rectum and Anal Canal: Female Anterior View


Inferior mesenteric v.
Inferior vena cava
Sigmoid vv.
Common iliac vv.
Median sacral v.
Superior anorectal v.
External iliac v.
Internal iliac v.
Obturator v.
Superior vesical v.
Uterine v.
Middle anorectal v.
Internal pudendal v.
Communication between internal and perimuscular anorectal venous plexuses
Vaginal v.
Inferior vesical v.
Internal pudendal v. (in pudendal canal)
Inferior anorectal v.
Communication between internal and external anorectal venous plexuses
Internal anorectal venous plexus
Perimuscular anorectal venous plexus
External anorectal venous plexus

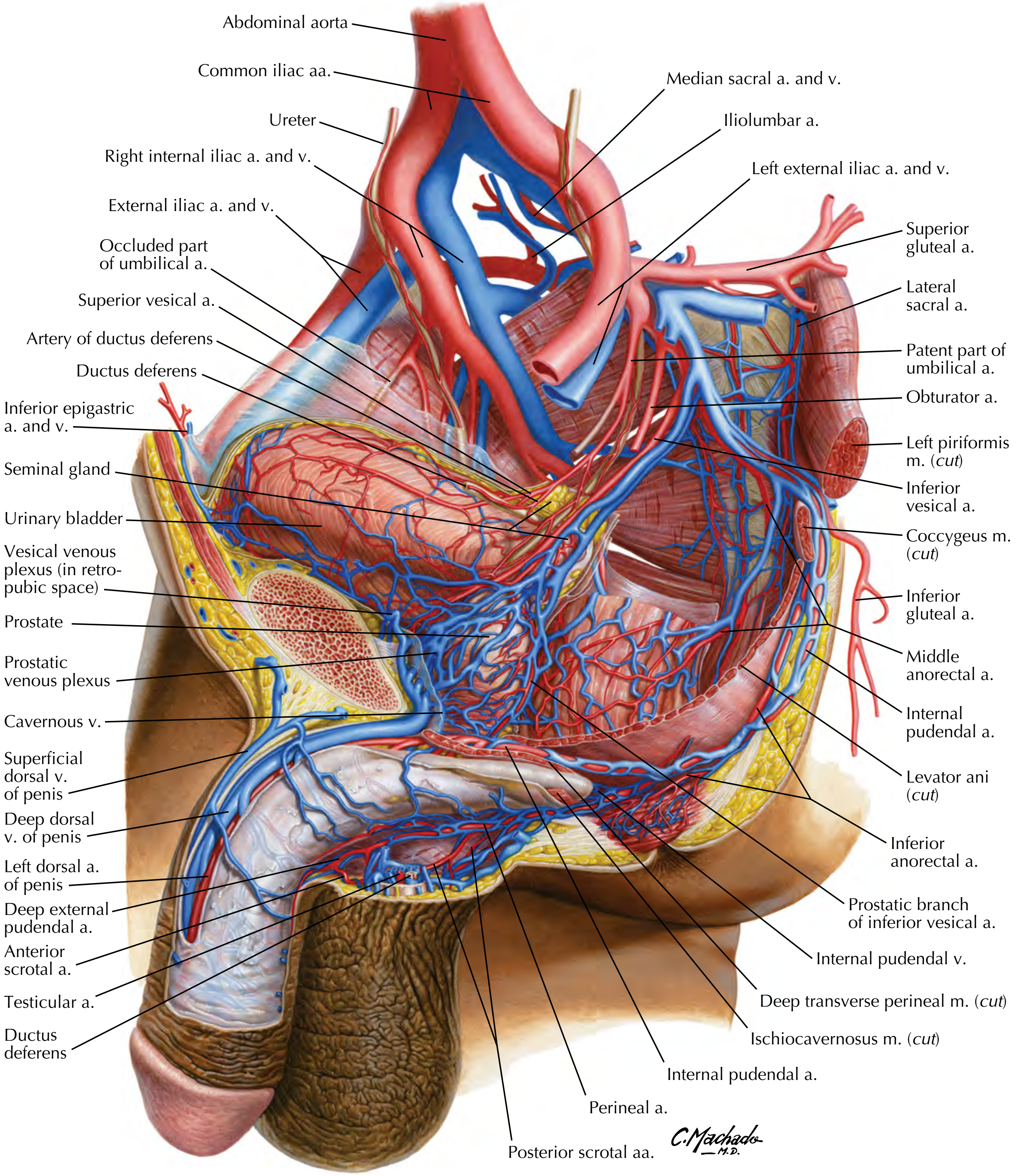

Renal a. and v.
Kidney
Ovarian a. and v.
Ureter
Inferior vena cava
Psoas major
Peritoneum (*cut edge*)
Suspensory ligament of ovary (contains ovarian a. and v.)
Rectum
Ovary
Uterine tube (fallopian)
Uterus
Round ligament of uterus
Vagina
Urinary bladder
Medial umbilical fold
Renal a. and v.
Ovarian a. and v.
Abdominal aorta
Ureter
Inferior mesenteric a.
Psoas major
Common iliac a.
Median sacral a. and v.
Superior anorectal a. (*cut*)
Round ligament of uterus (*cut*)
Ovarian a.
Internal iliac a.
External iliac a.
Obturator a. and n.
Patent part of umbilical a.
Middle anocrectal a.
Uterine a.
Vaginal a.
Inferior vesical a.
Round ligament of uterus (*cut*)
Superior vesical aa.
Inferior epigastric a. and v.
Occluded part of umbilical a.
Medial umbilical ligament
Median umbilical ligament
F. Netter M.D.


Renal a. and v.
Inferior vena cava
Abdominal aorta
Testicular a. and v.
Ureter
Inferior mesenteric a.
Common iliac a. and v.
Internal iliac a. and v.
External iliac a. and v.
Inferior vesical a.
Inferior epigastric a. and v.
Artery of ductus deferens
Cremasteric a. and v.
Testicular a. and v. (in spermatic cord)
Femoral a. and v.
Superficial external pudendal a. and v. (*cut and passing superficial to spermatic cord*)
Deep external pudendal a. and v.
Pampiniform (venous) plexus
Deep dorsal v. of penis
Dorsal a. of penis (under fascia of penis)

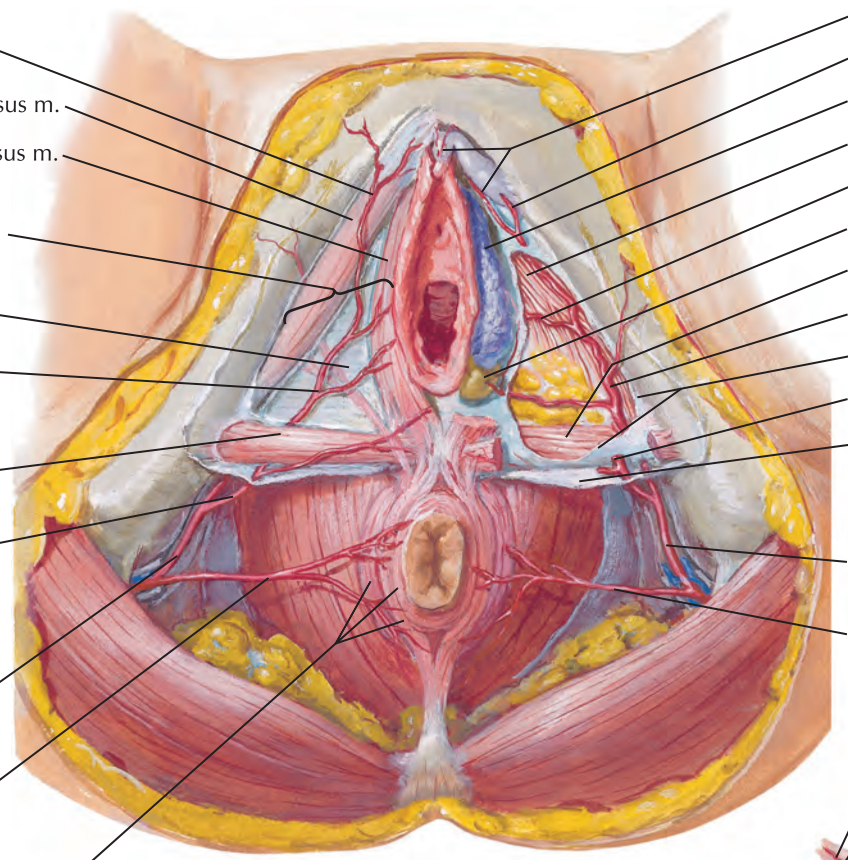

Sagittal section
Median sacral a.
Iliolumbar a.
Lateral sacral aa.
Superior gluteal a.
Piriformis m.
Inferior gluteal a.
Internal pudendal a.
Coccygeus m.
Sacrotuberous ligament
Obturator fascia (of obturator internus)
Internal pudendal a. (in pudendal canal)
Levator ani (*cut edge*)
Abdominal aorta
Right common iliac a.
Left common iliac a.
Internal iliac a.
Posterior division of internal iliac a.
Anterior division of internal iliac a.
External iliac a.
Patent part of umbilical a.
Obturator a.
Middle anorectal a.
Uterine a.
Vaginal a.
Medial umbilical ligament
Accessory obturator a.
Superior vesical aa.
Occluded part of umbilical a.
Pubic symphysis
Right paramedian section: lateral view
Abdominal aorta
Inferior vena cava
Right common iliac a.
Left common iliac a.
Ureters
External iliac a. (*cut*)
Internal iliac a.
Posterior division of internal iliac a.
Anterior division of internal iliac a.
Superior gluteal a.
Patent part of umbilical a.
Obturator a.
Piriformis m.
Internal pudendal a.
Inferior gluteal a.
Coccygeus m.
Middle anorectal a.
Uterine a.
Vaginal a.
Internal pudendal a.
Inferior anorectal a.
Superior vesical aa.
Occluded part of umbilical a.
Obturator canal
Obturator internus
Levator ani
F. Netter M.D.

Arteries and Veins of Pelvis: Male

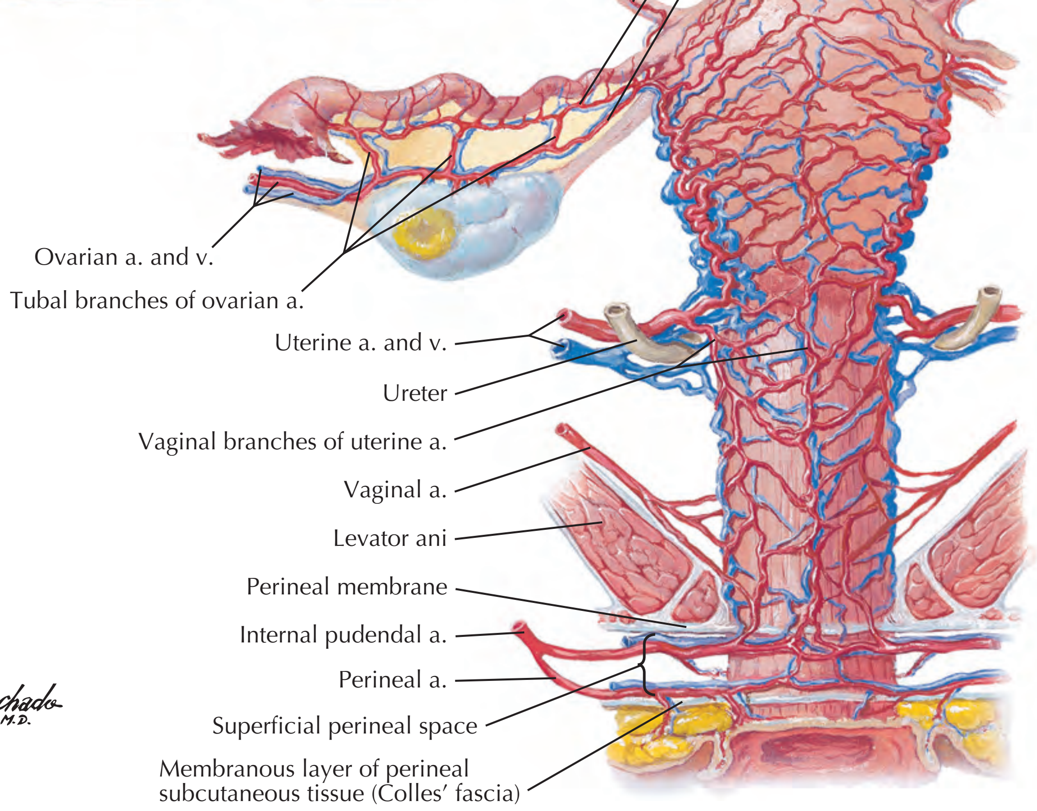
See also **Plates 93, BP 93**


Abdominal aorta
Common iliac aa.
Ureter
Right internal iliac a. and v.
External iliac a. and v.
Occluded part of umbilical a.
Superior vesical a.
Artery of ductus deferens
Ductus deferens
Inferior epigastric a. and v.
Seminal gland
Urinary bladder
Vesical venous plexus (in retropubic space)
Prostate
Prostatic venous plexus
Cavernous v.
Superficial dorsal v. of penis
Deep dorsal v. of penis
Left dorsal a. of penis
Deep external pudendal a.
Anterior scrotal a.
Testicular a.
Ductus deferens
Median sacral a. and v.
Iliolumbar a.
Left external iliac a. and v.
Superior gluteal a.
Lateral sacral a.
Patent part of umbilical a.
Obturator a.
Left piriformis m. (*cut*)
Inferior vesical a.
Coccygeus m. (*cut*)
Inferior gluteal a.
Middle anorectal a.
Internal pudendal a.
Levator ani (*cut*)
Inferior anorectal a.
Prostatic branch of inferior vesical a.
Internal pudendal v.
Deep transverse perineal m. (*cut*)
Ischiocavernosus m. (*cut*)
Internal pudendal a.
Perineal a.
Posterior scrotal aa.
C. Machado M.D.

Arteries and Veins of Perineum and Uterus


Posterior labial a.
Ischiocavernosus m.
Bulbospongiosus m.
Superficial perineal space
Perineal membrane
Perineal a.
Superficial transverse perineal m.
Perineal a.
Internal pudendal a. (in pudendal canal)
Inferior anorectal a.
External anal sphincter
Dorsal a. of clitoris
Deep a. of clitoris
Bulb of vestibule
Compressor urethrae
Artery to bulb of vestibule
Greater vestibular gland (Bartholin's)
Deep transverse perineal m.
Internal pudendal a.
Perineal membrane (*cut away*)
Perineal a. (*cut*)
Membranous layer of perineal subcutaneous tissue (Colles' fascia) (*cut and reflected to open superficial perineal space*)
Internal pudendal a. (in pudendal canal)
Inferior anorectal a.

Note: Perineal fascia (Gallaudet's) removed from muscles of superficial perineal space


Artery of round ligament of uterus
Tubal branch
Ovarian branch
Branches of uterine a.
Ovarian a. and v.
Tubal branches of ovarian a.
Uterine a. and v.
Ureter
Vaginal branches of uterine a.
Vaginal a.
Levator ani
Perineal membrane
Internal pudendal a.
Perineal a.
Superficial perineal space
Membranous layer of perineal subcutaneous tissue (Colles' fascia)

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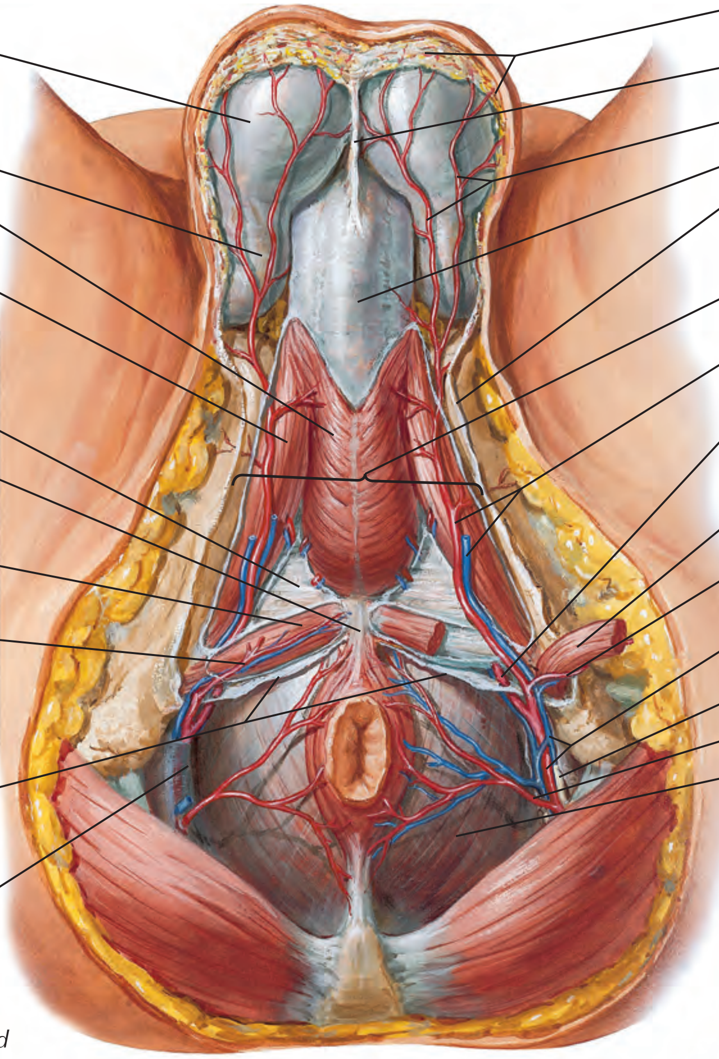
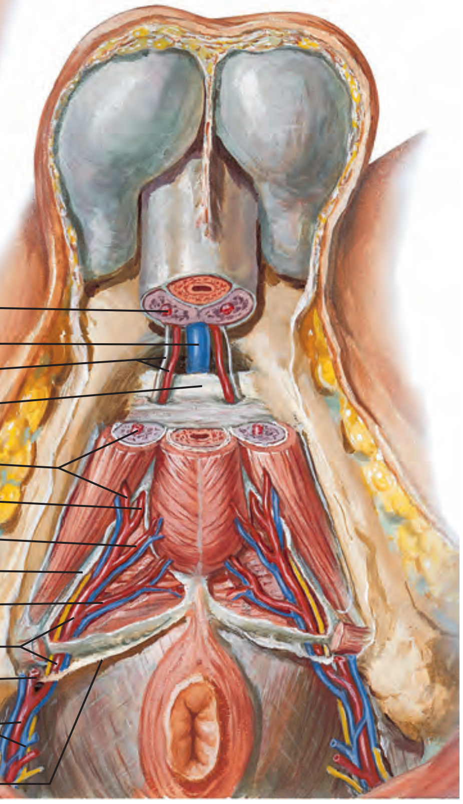
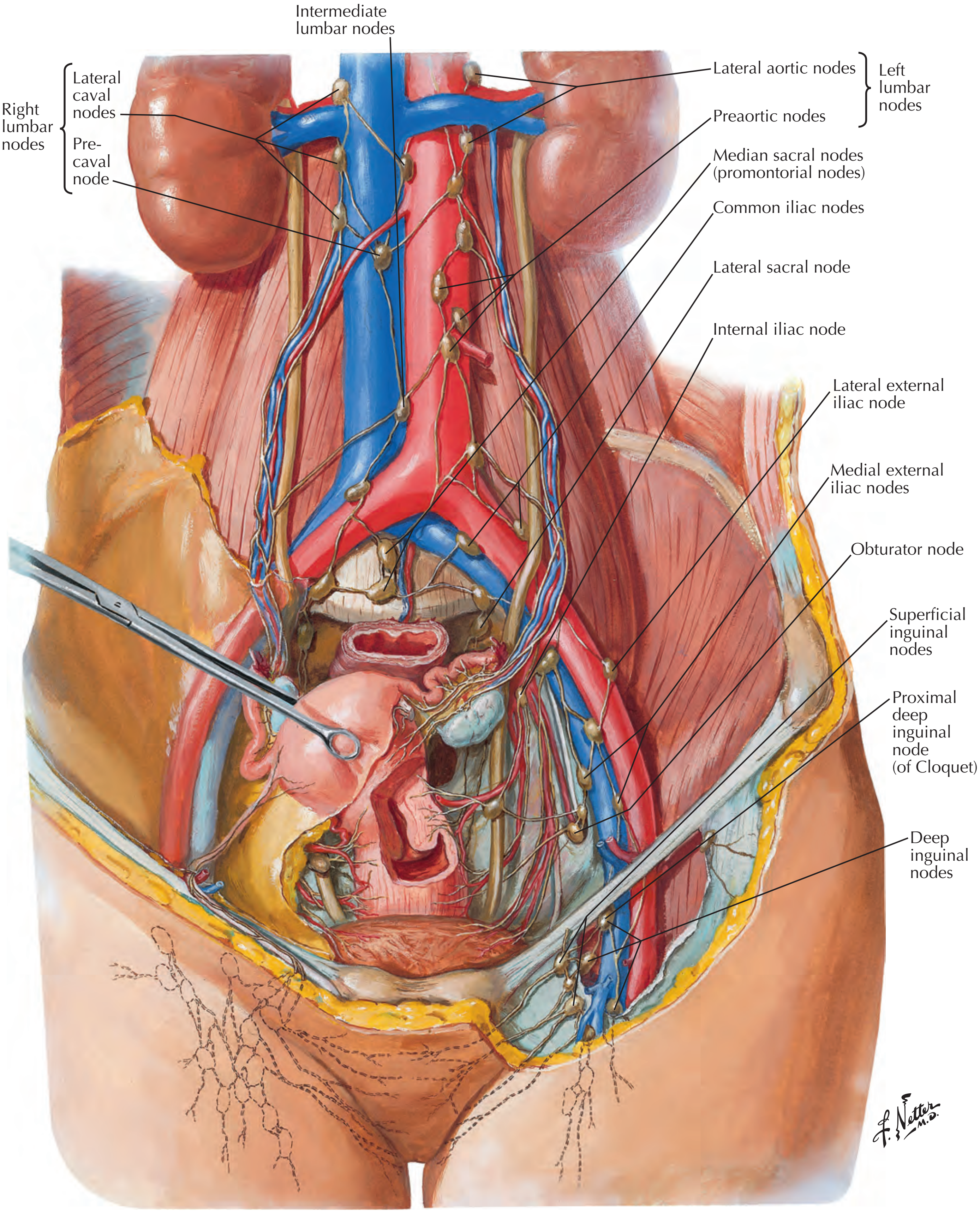
C. Machado M.D.

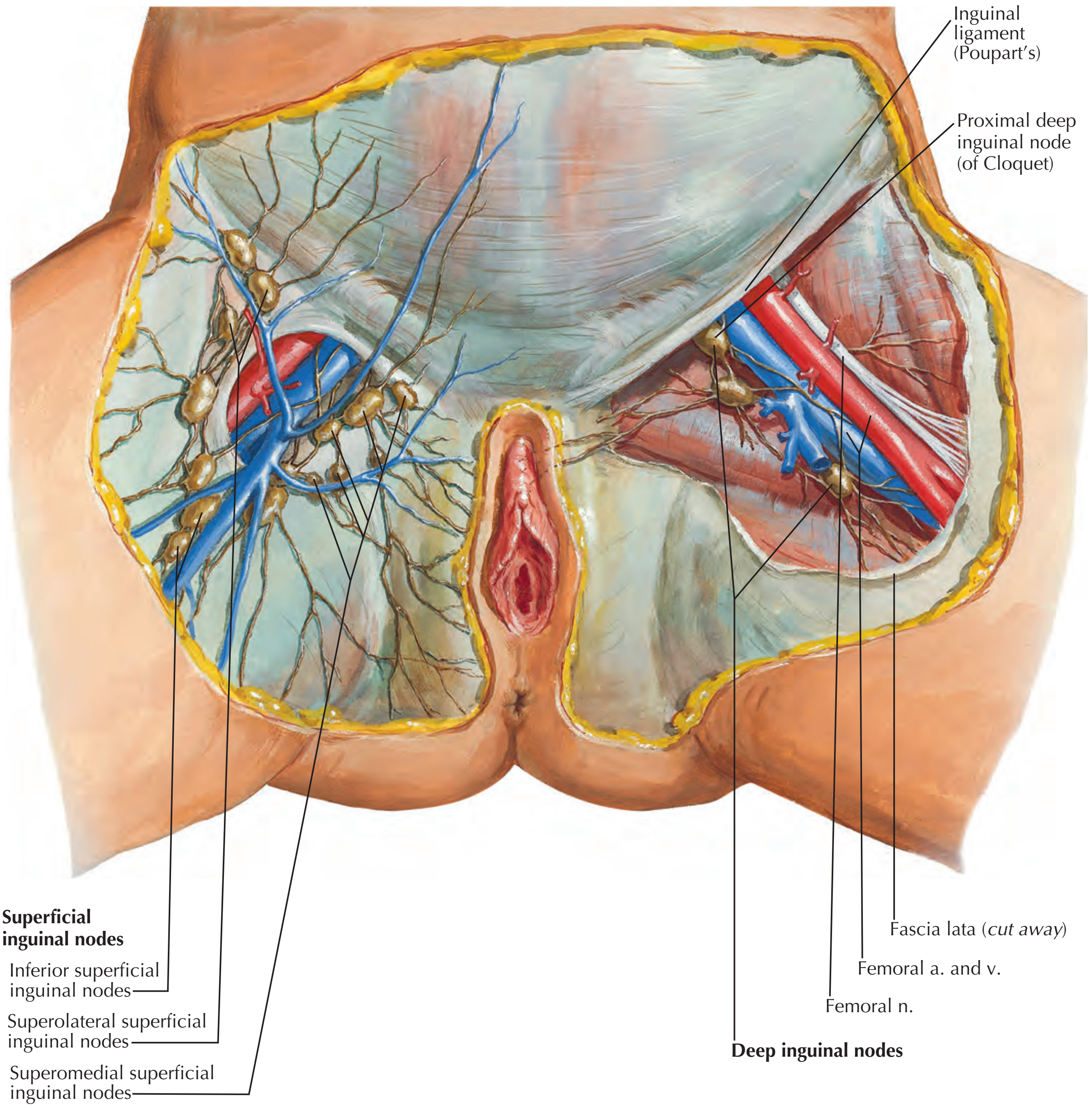
Arteries and Veins of Perineum: Male


External spermatic fascia (over testis)
External spermatic fascia (over spermatic cord)
Bulbospongiosus m.
Ischiocavernosus m.
Perineal membrane
Perineal body
Superficial transverse perineal m.
Transverse perineal a.
Membranous layer of perineal subcutaneous tissue (Colles' fascia) (*cut edge*)
Pudendal canal (Alcock's)
Dartos fascia of scrotum
Septum of scrotum
Posterior scrotal aa.
Fascia of penis (Buck's)
Membranous layer of perineal subcutaneous tissue (Colles' fascia) (*cut edge*)
Superficial perineal space (*opened*)
Perineal a. and v.
Internal pudendal a. (passes superior to perineal membrane)
Superficial transverse perineal m. (*cut and reflected*)
Transverse perineal a.
Internal pudendal a. and v. (*pudendal canal opened up*)
Pudendal n. (*cut*)
Inferior anorectal a.
Inferior fascia of pelvic diaphragm

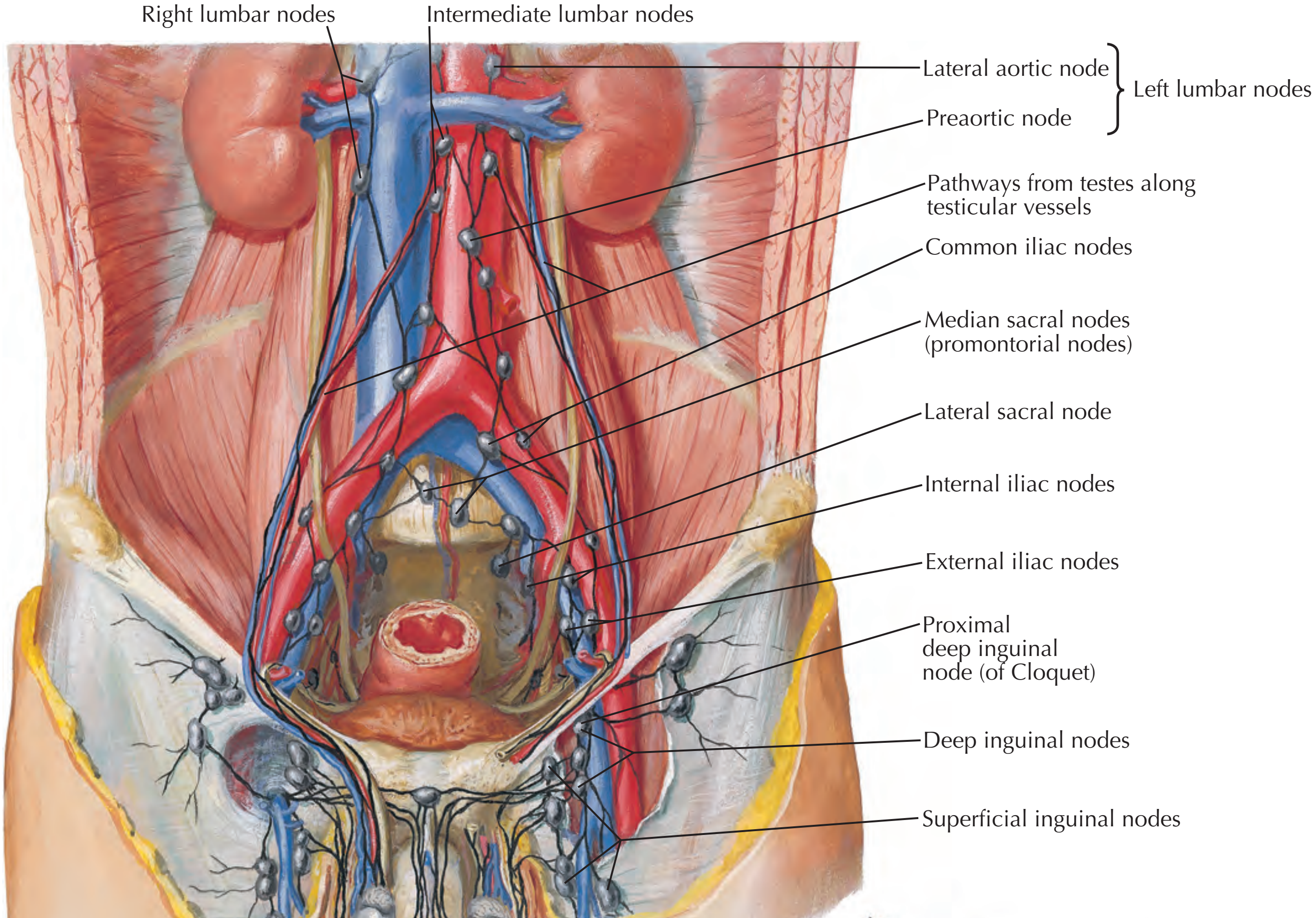
Note: Perineal fascia (Gallaudet's) removed from muscles of superficial perineal space

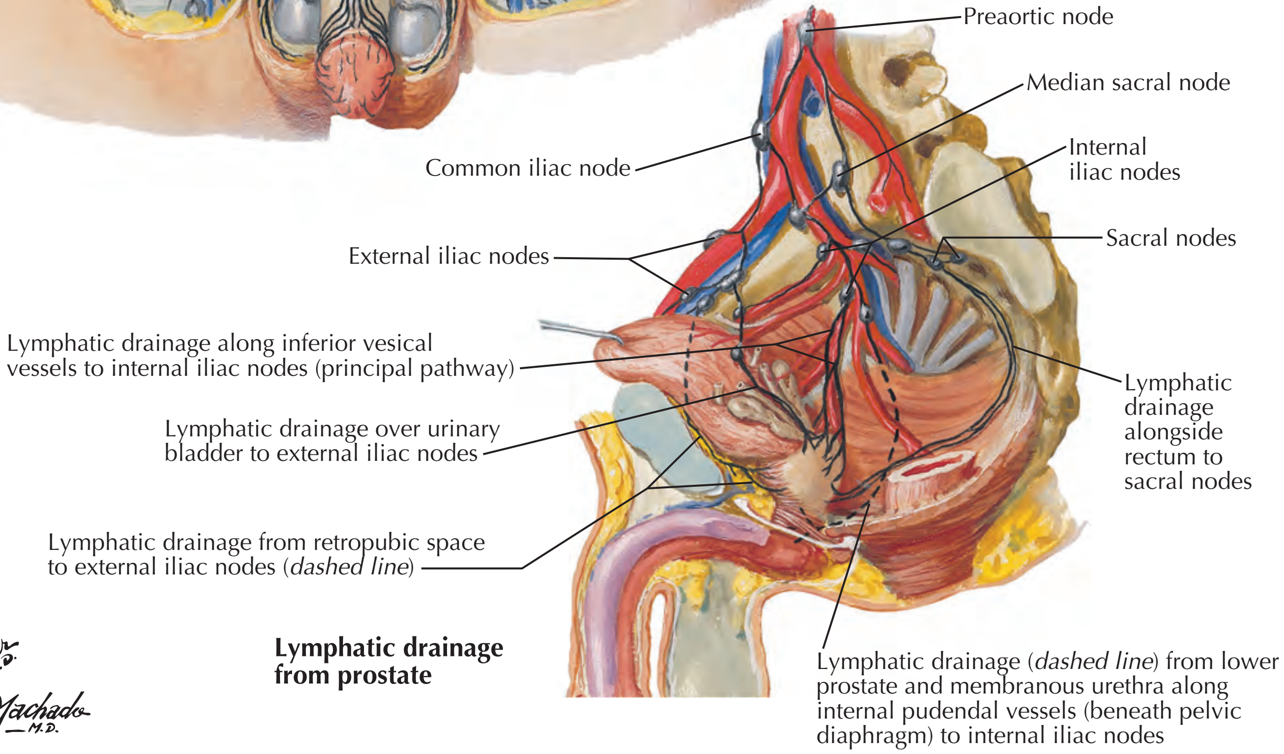

Deep a. of penis
Deep dorsal v. of penis
Dorsal a. and n. of penis
Transverse perineal ligament
Deep a. of penis
Dorsal a. of penis
Urethral a.
Perineal membrane (*cut edge*)
Artery of bulb of penis
Internal pudendal a.
Perineal a. (*cut*)
Internal pudendal a. and v. (in pudendal canal)
Membranous layer of perineal subcutaneous tissue (Colles' fascia) (*cut edge*)


Intermediate lumbar nodes
Right lumbar nodes
Lateral caval nodes
Pre-caval node
Lateral aortic nodes
Preaortic nodes
Left lumbar nodes
Median sacral nodes (promontorial nodes)
Common iliac nodes
Lateral sacral node
Internal iliac node
Lateral external iliac node
Medial external iliac nodes
Obturator node
Superficial inguinal nodes
Proximal deep inguinal node (of Cloquet)
Deep inguinal nodes
F. Netter M.D.


Inguinal ligament (Poupart's)
Proximal deep inguinal node (of Cloquet)
Superficial inguinal nodes
Inferior superficial inguinal nodes
Superolateral superficial inguinal nodes
Superomedial superficial inguinal nodes
Fascia lata (*cut away*)
Femoral a. and v.
Femoral n.
Deep inguinal nodes

Lymph Vessels and Lymph Nodes of Pelvis and Genitalia: Male


Right lumbar nodes
Intermediate lumbar nodes
Lateral aortic node
Preaortic node
Left lumbar nodes
Pathways from testes along testicular vessels
Common iliac nodes
Median sacral nodes (promontorial nodes)
Lateral sacral node
Internal iliac nodes
External iliac nodes
Proximal deep inguinal node (of Cloquet)
Deep inguinal nodes
Superficial inguinal nodes


Preaortic node
Median sacral node
Internal iliac nodes
Common iliac node
Sacral nodes
External iliac nodes
Lymphatic drainage along inferior vesical vessels to internal iliac nodes (principal pathway)
Lymphatic drainage alongside rectum to sacral nodes
Lymphatic drainage over urinary bladder to external iliac nodes
Lymphatic drainage from retropubic space to external iliac nodes (*dashed line*)
Lymphatic drainage (*dashed line*) from lower prostate and membranous urethra along internal pudendal vessels (beneath pelvic diaphragm) to internal iliac nodes
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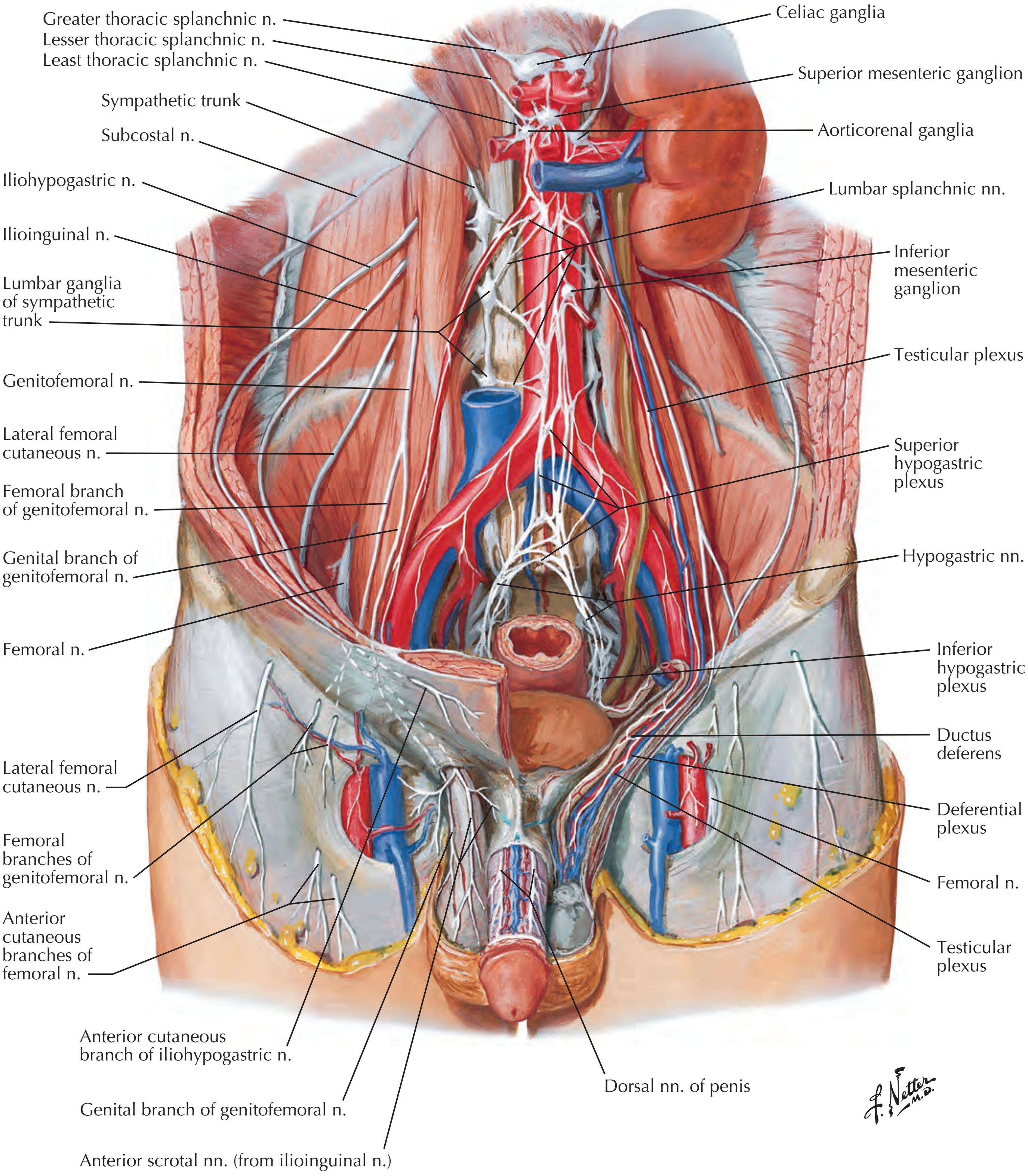
C. Machado M.D.

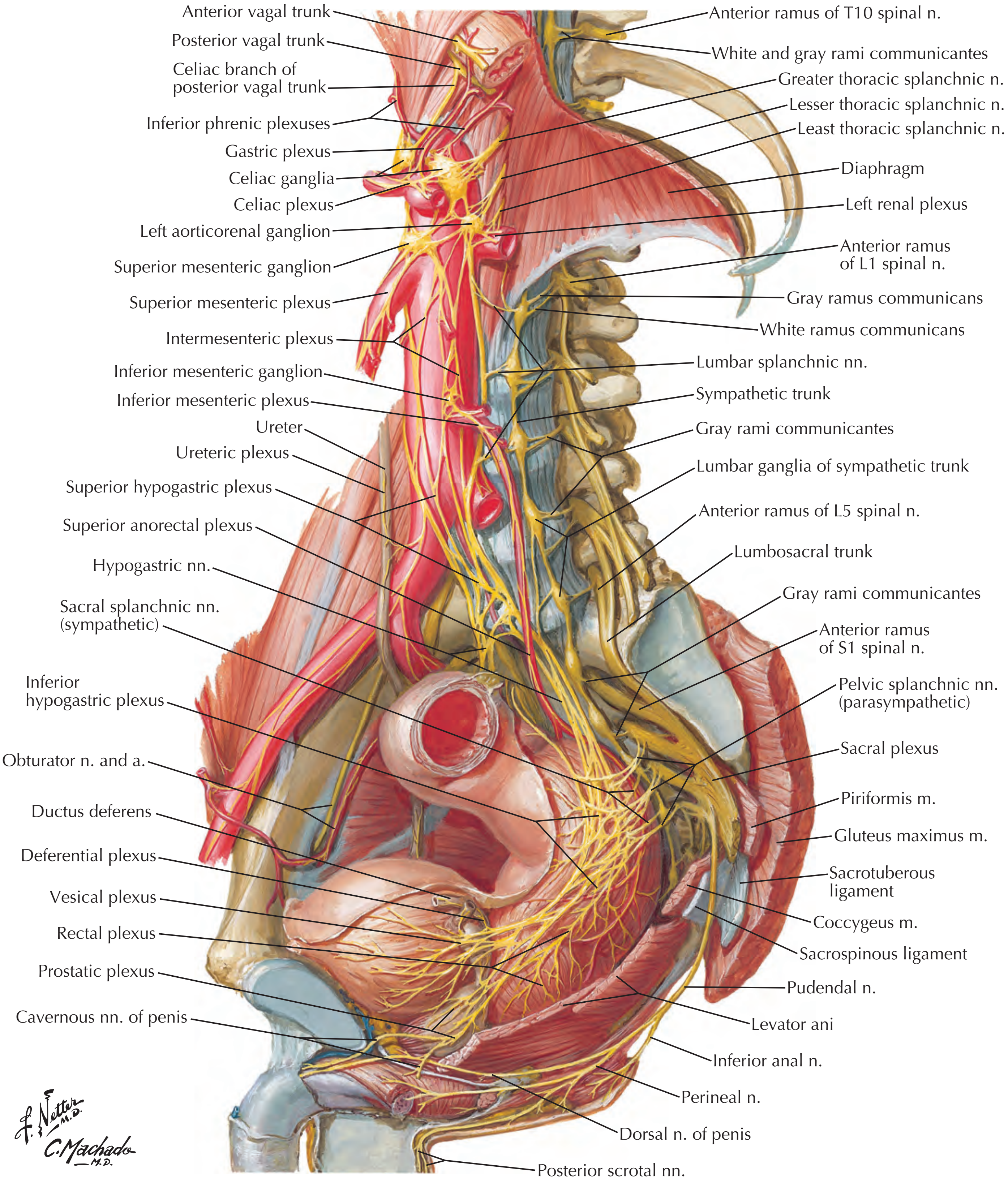
Lymphatic drainage from prostate

See also **Plate 319**

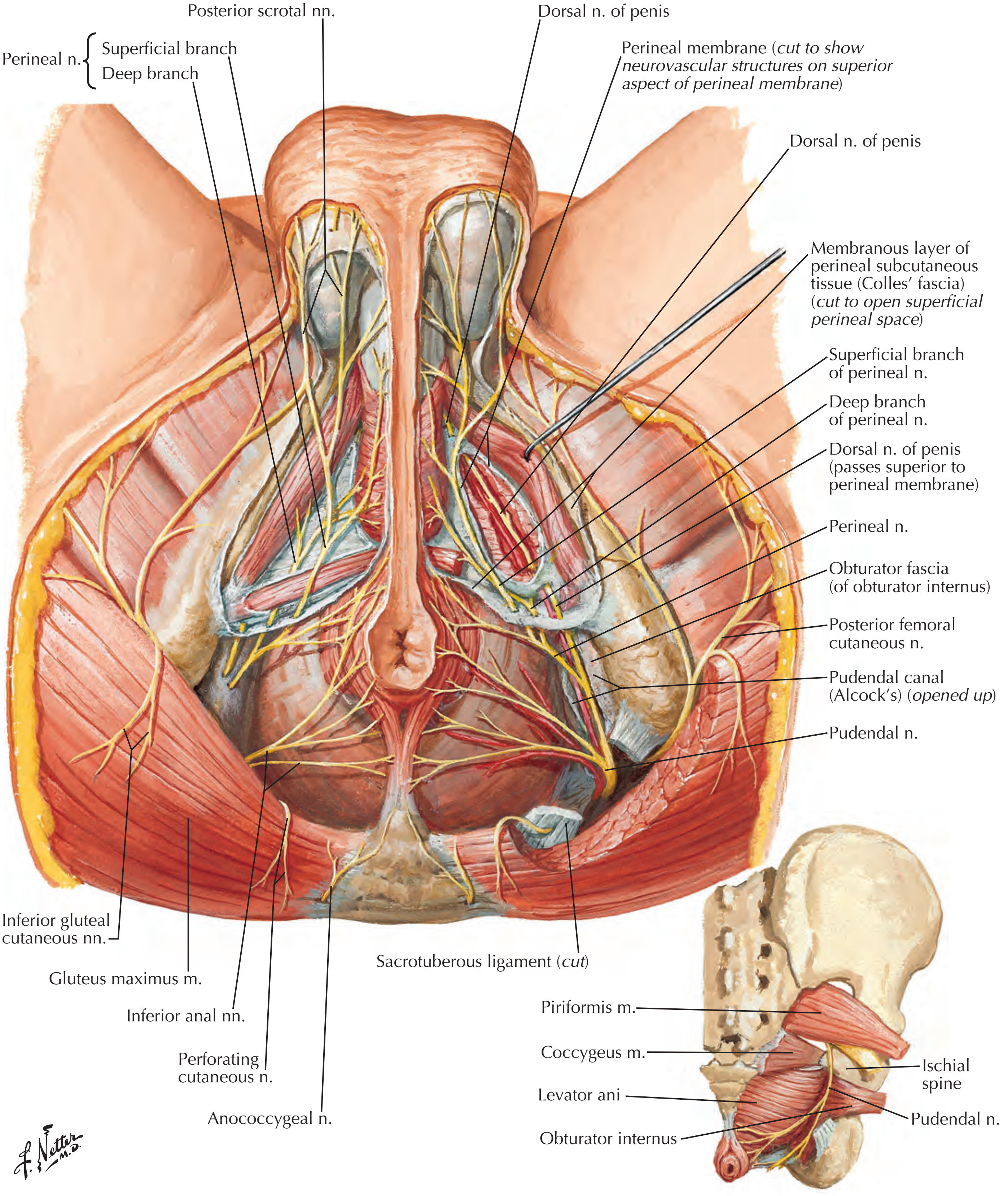

Greater thoracic splanchnic n.
Lesser thoracic splanchnic n.
Least thoracic splanchnic n.
Sympathetic trunk
Subcostal n.
Iliohypogastric n.
Ilioinguinal n.
Lumbar ganglia of sympathetic trunk
Genitofemoral n.
Lateral femoral cutaneous n.
Femoral branch of genitofemoral n.
Genital branch of genitofemoral n.
Femoral n.
Lateral femoral cutaneous n.
Femoral branches of genitofemoral n.
Anterior cutaneous branches of femoral n.
Anterior cutaneous branch of iliohypogastric n.
Genital branch of genitofemoral n.
Anterior scrotal nn. (from ilioinguinal n.)
Celiac ganglia
Superior mesenteric ganglion
Aorticorenal ganglia
Lumbar splanchnic nn.
Inferior mesenteric ganglion
Testicular plexus
Superior hypogastric plexus
Hypogastric nn.
Inferior hypogastric plexus
Ductus deferens
Deferential plexus
Femoral n.
Testicular plexus
Dorsal nn. of penis
F. Netter M.D.

Nerves of Pelvic Viscera: Male

See also **Plates 319, 399**

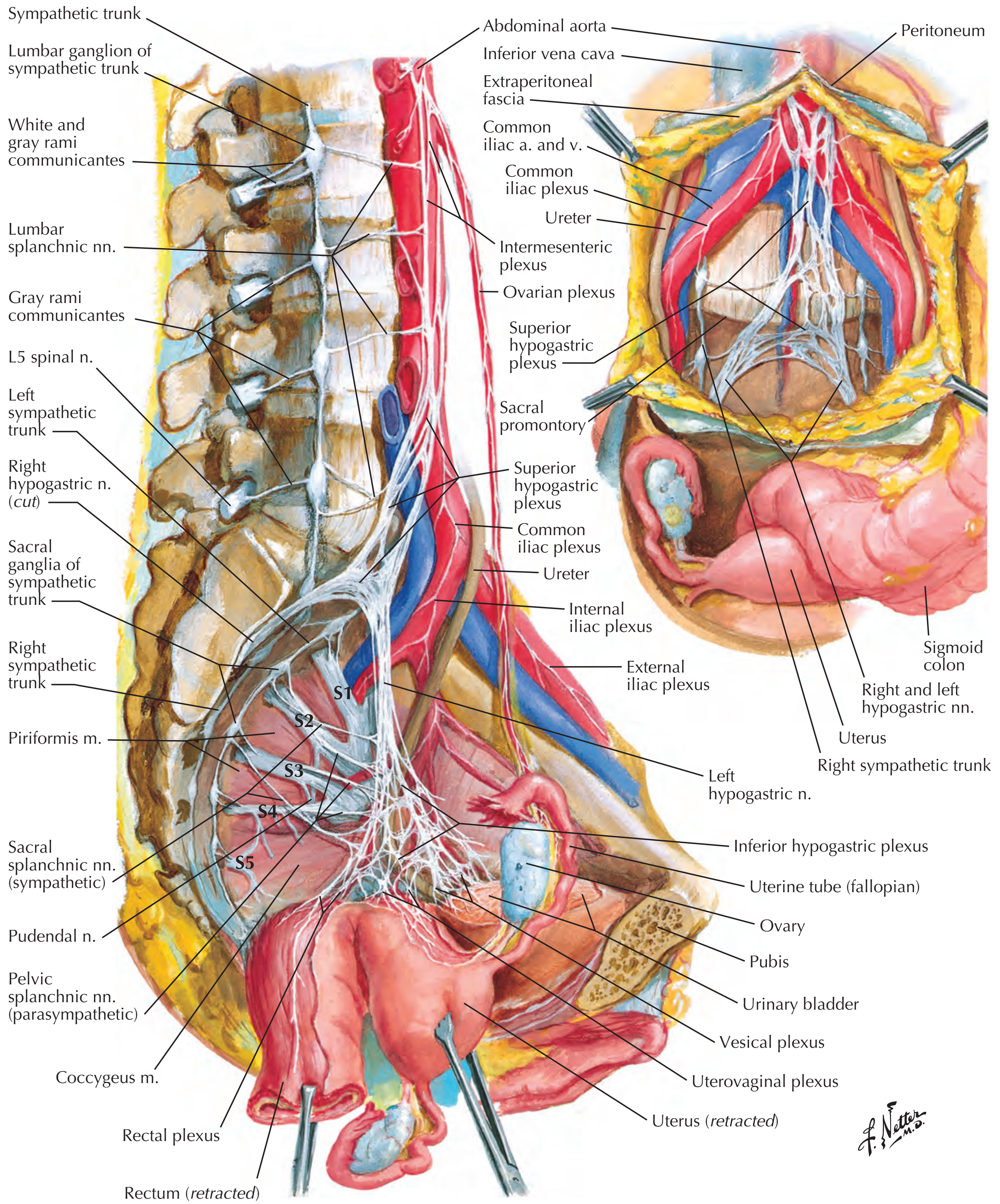

Anterior vagal trunk
Posterior vagal trunk
Celiac branch of posterior vagal trunk
Inferior phrenic plexuses
Gastric plexus
Celiac ganglia
Celiac plexus
Left aorticorenal ganglion
Superior mesenteric ganglion
Superior mesenteric plexus
Intermesenteric plexus
Inferior mesenteric ganglion
Inferior mesenteric plexus
Ureter
Ureteric plexus
Superior hypogastric plexus
Superior anorectal plexus
Hypogastric nn.
Sacral splanchnic nn. (sympathetic)
Inferior hypogastric plexus
Obturator n. and a.
Ductus deferens
Deferential plexus
Vesical plexus
Rectal plexus
Prostatic plexus
Cavernous nn. of penis
F. Netter M.D.
C. Machado M.D.
Anterior ramus of T10 spinal n.
White and gray rami communicantes
Greater thoracic splanchnic n.
Lesser thoracic splanchnic n.
Least thoracic splanchnic n.
Diaphragm
Left renal plexus
Anterior ramus of L1 spinal n.
Gray ramus communicans
White ramus communicans
Lumbar splanchnic nn.
Sympathetic trunk
Gray rami communicantes
Lumbar ganglia of sympathetic trunk
Anterior ramus of L5 spinal n.
Lumbosacral trunk
Gray rami communicantes
Anterior ramus of S1 spinal n.
Pelvic splanchnic nn. (parasympathetic)
Sacral plexus
Piriformis m.
Gluteus maximus m.
Sacrotuberous ligament
Coccygeus m.
Sacrospinous ligament
Pudendal n.
Levator ani
Inferior anal n.
Perineal n.
Dorsal n. of penis
Posterior scrotal nn.

See also **Plate 418**


Posterior scrotal nn.
Perineal n.
Superficial branch
Deep branch
Dorsal n. of penis
Perineal membrane (*cut to show neurovascular structures on superior aspect of perineal membrane*)
Dorsal n. of penis
Membranous layer of perineal subcutaneous tissue (Colles' fascia) (*cut to open superficial perineal space*)
Superficial branch of perineal n.
Deep branch of perineal n.
Dorsal n. of penis (passes superior to perineal membrane)
Perineal n.
Obturator fascia (of obturator internus)
Posterior femoral cutaneous n.
Pudendal canal (Alcock's) (*opened up*)
Pudendal n.
Inferior gluteal cutaneous nn.
Gluteus maximus m.
Inferior anal nn.
Perforating cutaneous n.
Anococcygeal n.
Sacrotuberous ligament (*cut*)
Piriformis m.
Coccygeus m.
Levator ani
Obturator internus
Ischial spine
Pudendal n.

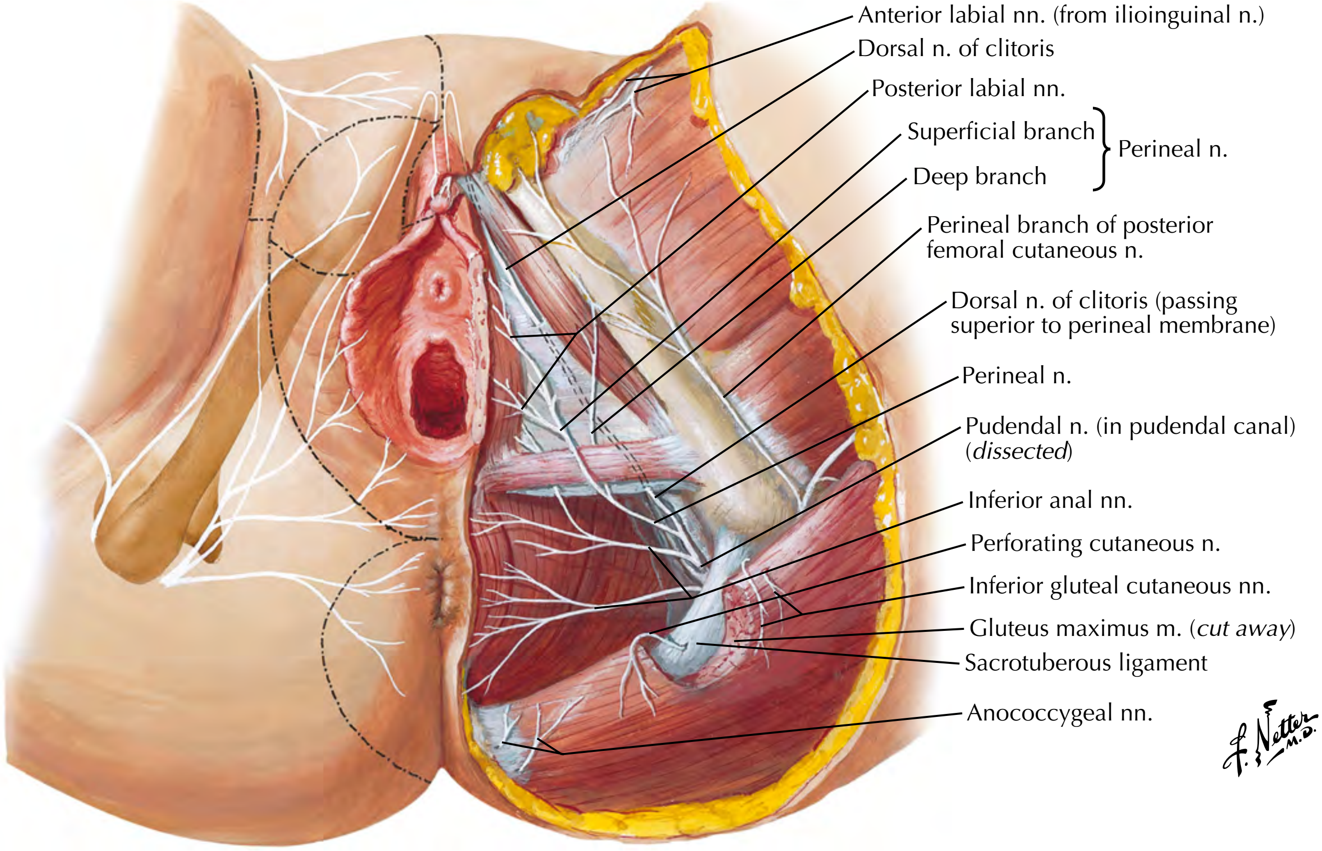
Nerves of Pelvic Viscera: Female

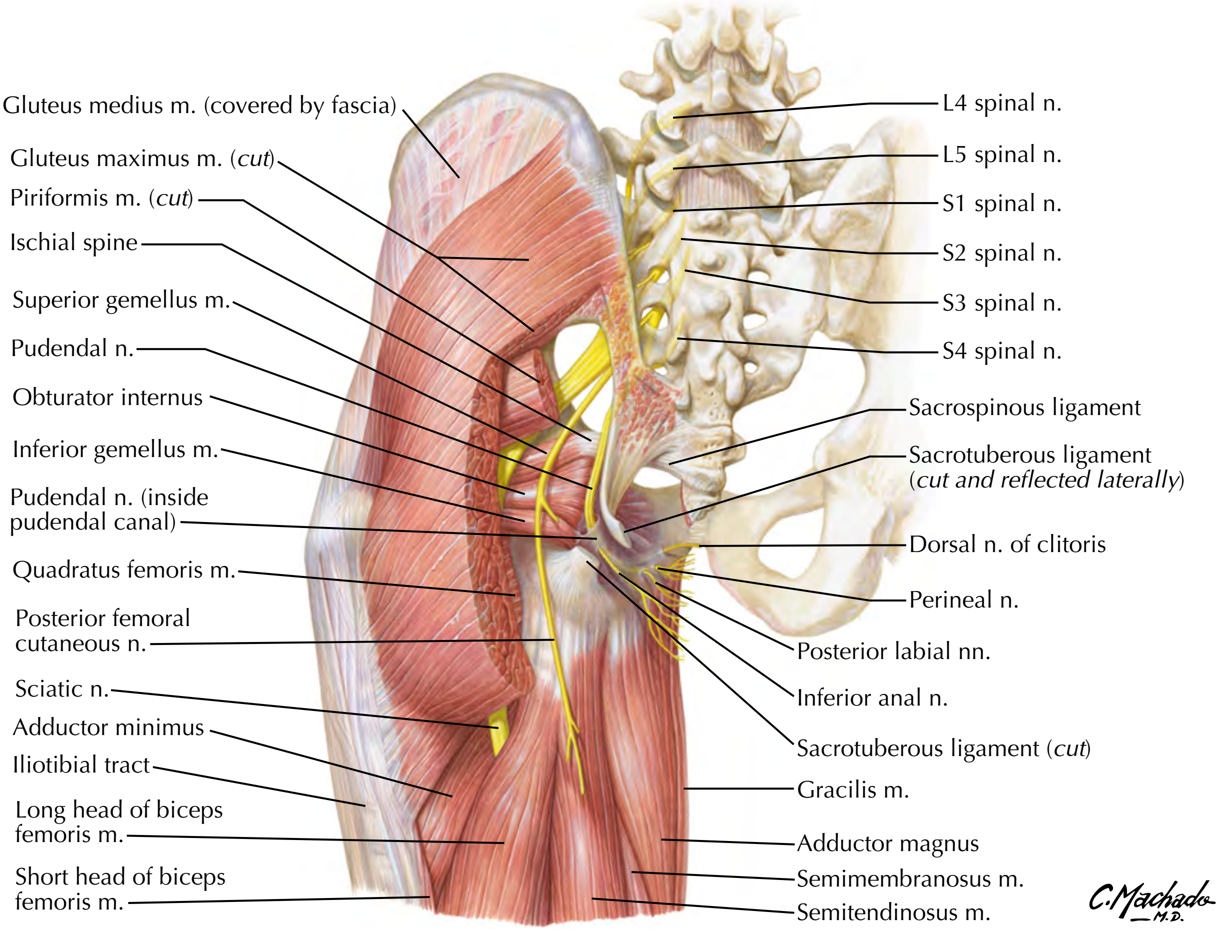
See also **Plate 319**

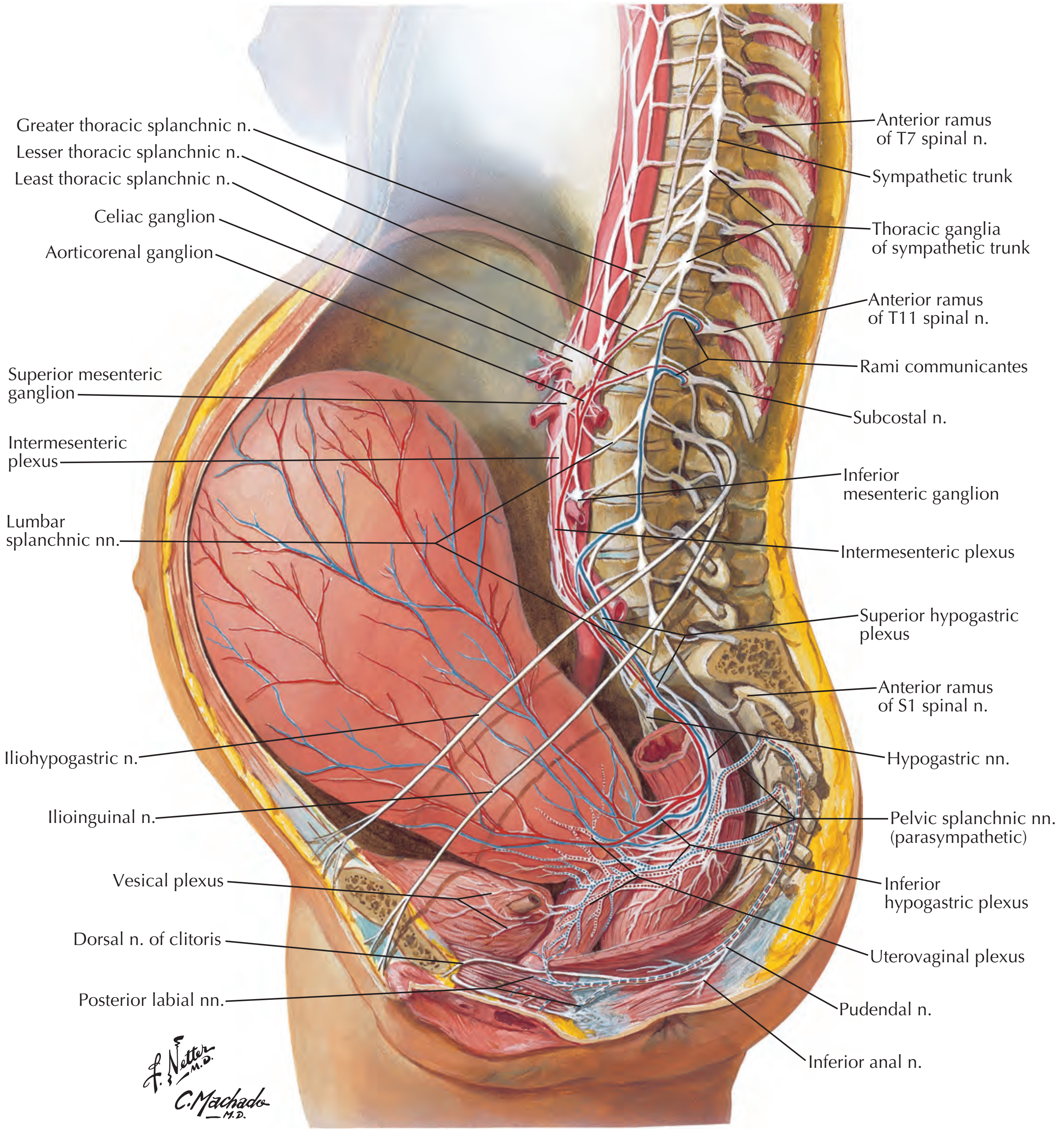

Sympathetic trunk
Lumbar ganglion of sympathetic trunk
White and gray rami communicantes
Lumbar splanchnic nn.
Gray rami communicantes
L5 spinal n.
Left sympathetic trunk
Right hypogastric n. (*cut*)
Sacral ganglia of sympathetic trunk
Right sympathetic trunk
Piriformis m.
Sacral splanchnic nn. (sympathetic)
Pudendal n.
Pelvic splanchnic nn. (parasympathetic)
Coccygeus m.
Rectal plexus
Rectum (*retracted*)
Abdominal aorta
Inferior vena cava
Extraperitoneal fascia
Common iliac a. and v.
Common iliac plexus
Ureter
Intermesenteric plexus
Ovarian plexus
Superior hypogastric plexus
Sacral promontory
Superior hypogastric plexus
Common iliac plexus
Ureter
Internal iliac plexus
External iliac plexus
Peritoneum
Sigmoid colon
Right and left hypogastric nn.
Uterus
Right sympathetic trunk
Left hypogastric n.
S1
S2
S3
S4
S5
Inferior hypogastric plexus
Uterine tube (fallopian)
Ovary
Pubis
Urinary bladder
Vesical plexus
Uterovaginal plexus
Uterus (*retracted*)
F. Netter M.D.

Nerves of Perineum and External Genitalia: Female

See also **Plate 417**


Anterior labial nn. (from ilioinguinal n.)
Dorsal n. of clitoris
Posterior labial nn.
Superficial branch
Deep branch
Perineal n.
Perineal branch of posterior femoral cutaneous n.
Dorsal n. of clitoris (passing superior to perineal membrane)
Perineal n.
Pudendal n. (in pudendal canal) (*dissected*)
Inferior anal nn.
Perforating cutaneous n.
Inferior gluteal cutaneous nn.
Gluteus maximus m. (*cut away*)
Sacrotuberous ligament
Anococcygeal nn.
F. Netter M.D.


Gluteus medius m. (covered by fascia)
Gluteus maximus m. (*cut*)
Piriformis m. (*cut*)
Ischial spine
Superior gemellus m.
Pudendal n.
Obturator internus
Inferior gemellus m.
Pudendal n. (inside pudendal canal)
Quadratus femoris m.
Posterior femoral cutaneous n.
Sciatic n.
Adductor minimus
Iliotibial tract
Long head of biceps femoris m.
Short head of biceps femoris m.
L4 spinal n.
L5 spinal n.
S1 spinal n.
S2 spinal n.
S3 spinal n.
S4 spinal n.
Sacrospinous ligament
Sacrotuberous ligament (*cut and reflected laterally*)
Dorsal n. of clitoris
Perineal n.
Posterior labial nn.
Inferior anal n.
Sacrotuberous ligament (*cut*)
Gracilis m.
Adductor magnus
Semimembranosus m.
Semitendinosus m.
C. Machado M.D.


Greater thoracic splanchnic n.
Lesser thoracic splanchnic n.
Least thoracic splanchnic n.
Celiac ganglion
Aorticorenal ganglion
Superior mesenteric ganglion
Intermesenteric plexus
Lumbar splanchnic nn.
Iliohypogastric n.
Ilioinguinal n.
Vesical plexus
Dorsal n. of clitoris
Posterior labial nn.
Anterior ramus of T7 spinal n.
Sympathetic trunk
Thoracic ganglia of sympathetic trunk
Anterior ramus of T11 spinal n.
Rami communicantes
Subcostal n.
Inferior mesenteric ganglion
Intermesenteric plexus
Superior hypogastric plexus
Anterior ramus of S1 spinal n.
Hypogastric nn.
Pelvic splanchnic nn. (parasympathetic)
Inferior hypogastric plexus
Uterovaginal plexus
Pudendal n.
Inferior anal n.
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—— Sensory fibers from body and fundus of uterus accompany sympathetic fibers to lower thoracic part of spinal cord via hypogastric plexuses

·········· Sensory fibers from cervix and upper vagina accompany parasympathetic fibers to sacral part of spinal cord via pelvic splanchnic nerves

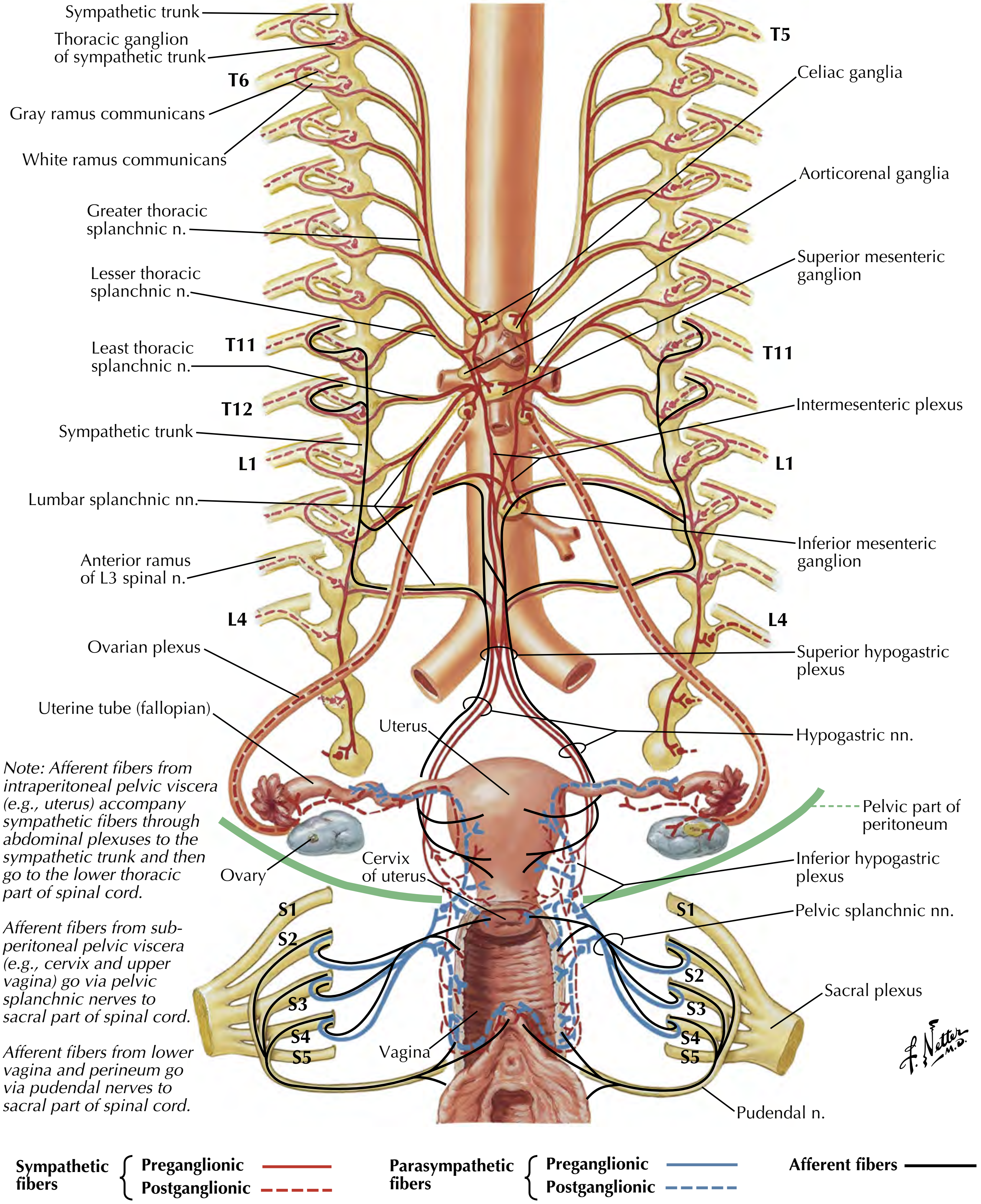
– – – – Sensory fibers from lower vagina and perineum accompany somatic motor fibers to sacral part of spinal cord via pudendal nerve

—— Sympathetic fibers to body and fundus of uterus

·········· Parasympathetic fibers to lower uterine segment, cervix, and upper vagina

- - - - - - Somatic motor fibers to lower vagina and perineum via pudendal nerve

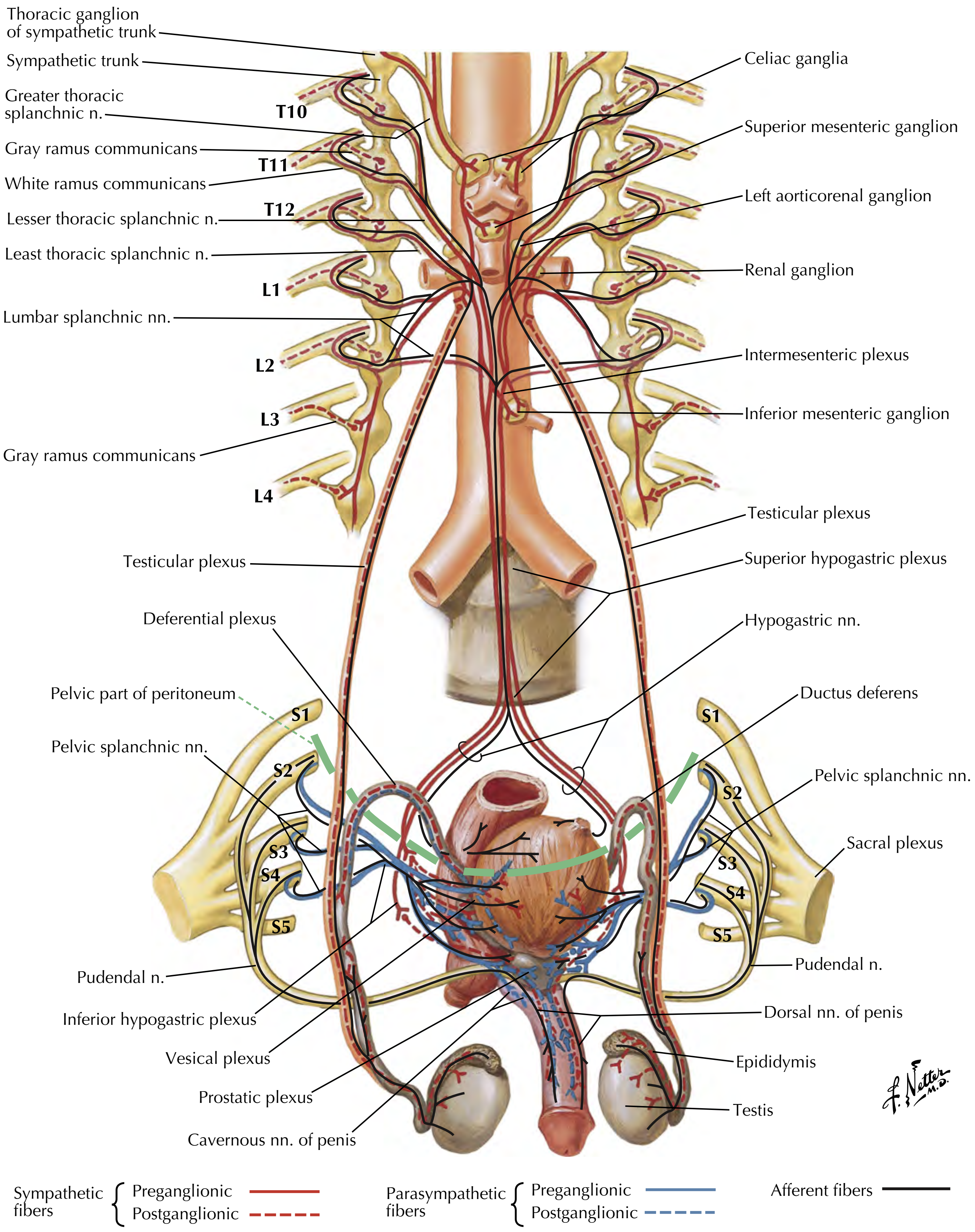
Innervation of Female Reproductive Organs: Schema


Sympathetic trunk
Thoracic ganglion of sympathetic trunk
T6
Gray ramus communicans
White ramus communicans
Greater thoracic splanchnic n.
Lesser thoracic splanchnic n.
T11
Least thoracic splanchnic n.
T12
Sympathetic trunk
L1
Lumbar splanchnic nn.
Anterior ramus of L3 spinal n.
L4
Ovarian plexus
Uterine tube (fallopian)
Uterus
Ovary
Cervix of uterus
S1
S2
S3
S4
S5
Vagina
T5
Celiac ganglia
Aorticorenal ganglia
Superior mesenteric ganglion
T11
Intermesenteric plexus
L1
Inferior mesenteric ganglion
L4
Superior hypogastric plexus
Hypogastric nn.
Pelvic part of peritoneum
Inferior hypogastric plexus
S1
Pelvic splanchnic nn.
S2
Sacral plexus
S3
S4
S5
Pudendal n.
Sympathetic fibers
Preganglionic
Postganglionic
Parasympathetic fibers
Preganglionic
Postganglionic
Afferent fibers

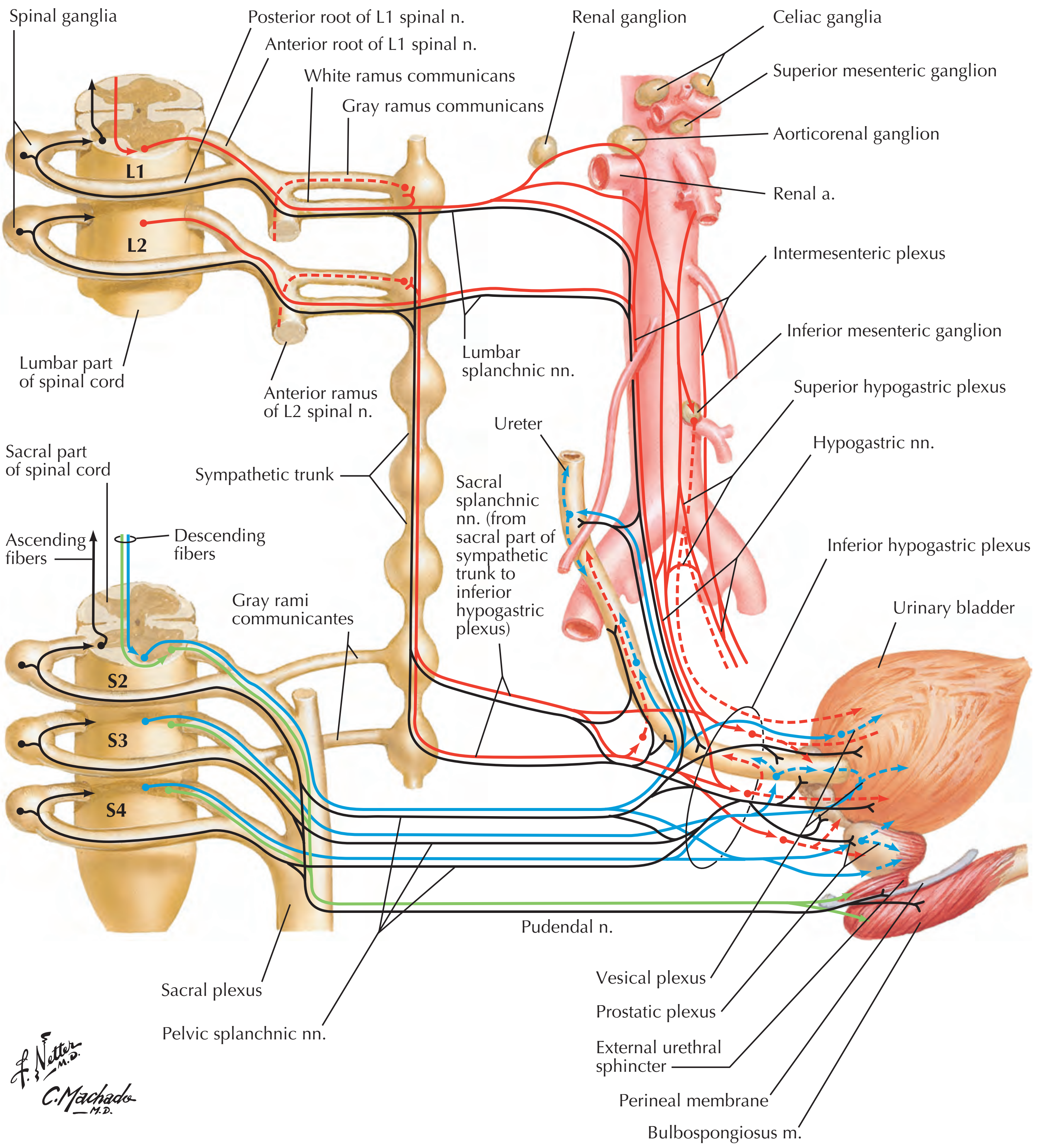
Note: Afferent fibers from intraperitoneal pelvic viscera (e.g., uterus) accompany sympathetic fibers through abdominal plexuses to the sympathetic trunk and then go to the lower thoracic part of spinal cord.

Afferent fibers from subperitoneal pelvic viscera (e.g., cervix and upper vagina) go via pelvic splanchnic nerves to sacral part of spinal cord.

Afferent fibers from lower vagina and perineum go via pudendal nerves to sacral part of spinal cord.


Thoracic ganglion of sympathetic trunk
Sympathetic trunk
Greater thoracic splanchnic n.
Gray ramus communicans
White ramus communicans
Lesser thoracic splanchnic n.
Least thoracic splanchnic n.
Lumbar splanchnic nn.
Gray ramus communicans
T10
T11
T12
L1
L2
L3
L4
Celiac ganglia
Superior mesenteric ganglion
Left aorticorenal ganglion
Renal ganglion
Intermesenteric plexus
Inferior mesenteric ganglion
Testicular plexus
Superior hypogastric plexus
Hypogastric nn.
Testicular plexus
Deferential plexus
Pelvic part of peritoneum
Pelvic splanchnic nn.
S1
S2
S3
S4
S5
Ductus deferens
Pelvic splanchnic nn.
Sacral plexus
Pudendal n.
Pudendal n.
Inferior hypogastric plexus
Vesical plexus
Prostatic plexus
Cavernous nn. of penis
Dorsal nn. of penis
Epididymis
Testis
F. Netter M.D.
Sympathetic fibers
Preganglionic
Postganglionic
Parasympathetic fibers
Preganglionic
Postganglionic
Afferent fibers

Innervation of Urinary Bladder and Lower Ureter: Schema


Spinal ganglia
Posterior root of L1 spinal n.
Anterior root of L1 spinal n.
White ramus communicans
Gray ramus communicans
Renal ganglion
Celiac ganglia
Superior mesenteric ganglion
Aorticorenal ganglion
Renal a.
L1
L2
Intermesenteric plexus
Inferior mesenteric ganglion
Lumbar part of spinal cord
Anterior ramus of L2 spinal n.
Lumbar splanchnic nn.
Superior hypogastric plexus
Ureter
Hypogastric nn.
Sacral part of spinal cord
Sympathetic trunk
Sacral splanchnic nn. (from sacral part of sympathetic trunk to inferior hypogastric plexus)
Ascending fibers
Descending fibers
Inferior hypogastric plexus
Gray rami communicantes
Urinary bladder
S2
S3
S4
Pudendal n.
Sacral plexus
Pelvic splanchnic nn.
Vesical plexus
Prostatic plexus
External urethral sphincter
Perineal membrane
Bulbospongiosus m.
F. Netter M.D.
C. Machado M.D.

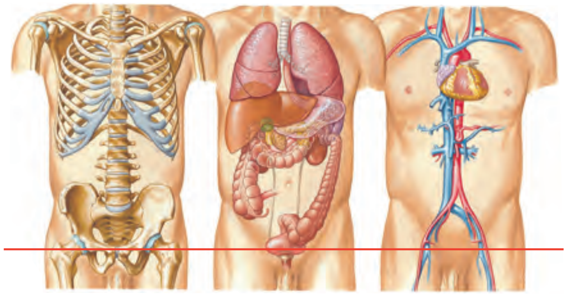
Sympathetic fibers { **Preganglionic** ━━━ **Postganglionic** - - - -

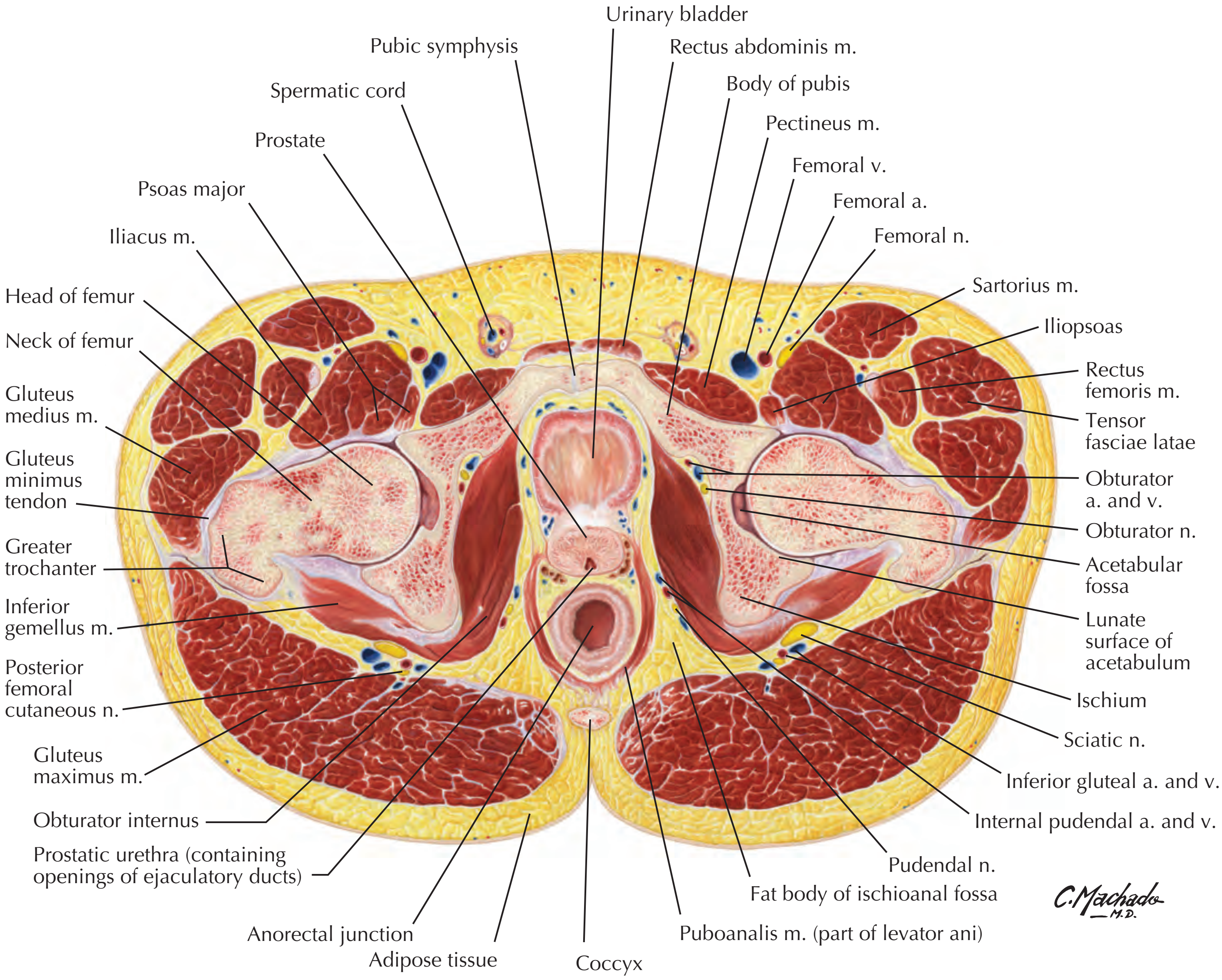
Parasympathetic fibers { **Preganglionic** ━━━ **Postganglionic** - - - -

Somatic efferent fibers ━━━

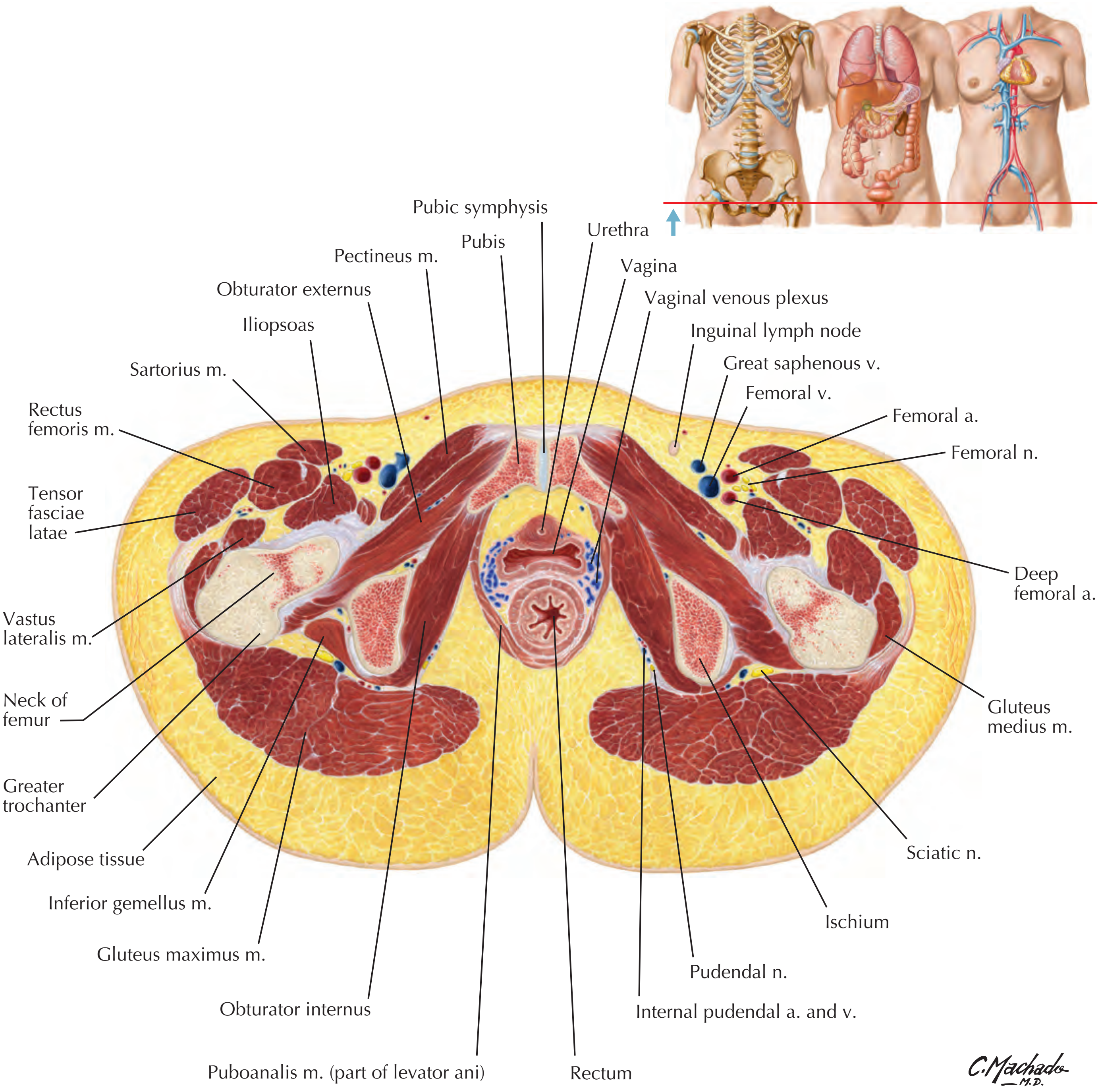
Afferent fibers ━━━

Male Pelvis: Cross Section of Bladder–Prostate Junction




Urinary bladder
Pubic symphysis
Rectus abdominis m.
Spermatic cord
Body of pubis
Prostate
Pectineus m.
Femoral v.
Psoas major
Femoral a.
Iliacus m.
Femoral n.
Sartorius m.
Head of femur
Iliopsoas
Neck of femur
Rectus femoris m.
Gluteus medius m.
Tensor fasciae latae
Gluteus minimus tendon
Obturator a. and v.
Obturator n.
Greater trochanter
Acetabular fossa
Inferior gemellus m.
Lunate surface of acetabulum
Posterior femoral cutaneous n.
Ischium
Sciatic n.
Gluteus maximus m.
Inferior gluteal a. and v.
Obturator internus
Internal pudendal a. and v.
Prostatic urethra (containing openings of ejaculatory ducts)
Pudendal n.
Fat body of ischioanal fossa
Anorectal junction
Adipose tissue
Coccyx
Puboanalis m. (part of levator ani)
C.Machado M.D.

Female Pelvis: Cross Section of Vagina and Urethra


Pubic symphysis
Pubis
Urethra
Pectineus m.
Vagina
Obturator externus
Vaginal venous plexus
Iliopsoas
Inguinal lymph node
Sartorius m.
Great saphenous v.
Femoral v.
Rectus femoris m.
Femoral a.
Femoral n.
Tensor fasciae latae
Deep femoral a.
Vastus lateralis m.
Neck of femur
Gluteus medius m.
Greater trochanter
Sciatic n.
Adipose tissue
Inferior gemellus m.
Ischium
Gluteus maximus m.
Pudendal n.
Obturator internus
Internal pudendal a. and v.
Puboanalis m. (part of levator ani)
Rectum
C. Machado M.D.

ANATOMICAL STRUCTURE	CLINICAL COMMENT	PLATE NUMBERS
Nervous System and Sense Organs		
Pudendal nerve	Pudendal block is performed to anesthetize the perineum for childbirth or minor surgical procedures in the perineum	415
Inferior anal (rectal) nerve	Anesthetized in ischioanal fossa for surgical excision of external hemorrhoids	413
Prostatic plexus and cavernous nerves	Disruption of these nerves during procedures (e.g., prostate surgery) can produce inability to achieve erection	412
Skeletal System		
Pubic symphysis	Palpable landmark used to obtain pelvic measurements (e.g., diagonal conjugate) that may be used to assess adequacy of pelvis for childbirth; during prenatal examinations, used for estimating fetal growth (symphysis–fundal height measurement); injury may result in widening on x-ray	355
Ischial spine	Palpable landmark used to estimate interspinous diameter for childbirth and to locate pudendal nerve for pudendal nerve block	355
Ischial tuberosity	Palpable landmark used to estimate width of pelvic outlet for childbirth; proximal attachment site of hamstring muscles	355
Superior pubic ramus	Often fractured by lateral compression injury of pelvis in anteroposterior plane by crush injury or falls in elderly with osteoporosis	353
Sacroiliac joint	Stiffening, sclerosis, and fusion occur in autoimmune disease known as ankylosing spondylitis; difficult diagnosis to make and known to refer pain to adjacent joints	355
Muscular System		
Pelvic diaphragm (levator ani and coccygeus muscle)	Provides support to urethrovesical angle, helping to maintain urinary continence; weakness or injury during childbirth can lead to stress urinary incontinence in women	359, 370
Pelvic extraperitoneal (endopelvic) fascia	Weakness or tearing of endopelvic fascial ligaments (e.g., pubovesical or cardinal ligaments) may result in prolapse of pelvic organs	366, 373
Perineal body	Tearing of perineal body may occur during childbirth; prophylactic incision into or lateral to perineal body, known as episiotomy, may be performed to facilitate vaginal delivery in some circumstances	379
Cardiovascular System		
Pampiniform plexus	Dilation of these veins can cause testicular varicocele, affecting testicular temperature regulation and potentially contributing to infertility; most commonly occurs on left side due to longer course of left gonadal vein and angle of drainage into renal vein	403
Uterine artery	Ligated or cauterized during hysterectomy; selective embolization of branches may be performed to treat uterine fibroids	402, 406
Deep and dorsal arteries of penis, and cavernous tissue	Blockage or loss of vascular smooth muscle function can lead to erectile dysfunction, treated with vasodilators	407
Internal iliac veins	Provide communication between prostatic venous plexus and veins draining vertebral column, which is route of spread for prostate cancer	405
Anorectal (rectal) veins	Portal hypertension may cause dilated anorectal veins if portosystemic anastomoses develop between superior anorectal veins (portal drainage) and middle and/or inferior anorectal veins (systemic drainage)	318, 401
Internal and external anorectal (rectal) venous plexuses	Enlargement may result in painful condition known as hemorrhoids	395, 401

ANATOMICAL STRUCTURE	CLINICAL COMMENT	PLATE NUMBERS
Lymph Vessels and Lymphoid Organs		
Pelvic and lumbar nodes	Spread of ovarian cancer cells via venous drainage to inferior vena cava and lungs or via lymphatics	408
Lumbar and tracheobronchial nodes	Prostate cancer cells may spread via lymphatics to retroperitoneum and mediastinum	260, 410
Lumbar (e.g., lateral aortic, preaortic, lateral caval) nodes	Receive lymphatic drainage from ovary, uterine tube, and fundus of uterus in women and from testis in men; cancers in these organs may therefore spread to retroperitoneum	408, 410
Pelvic nodes	Sampling or dissection is performed to assess spread of gynecological malignancies	408
Digestive System		
Rectum and anal canal	Examined by digital rectal examination to detect internal hemorrhoids, fecal impaction, and rectal cancer	301, 393, 395
Peritoneum	Common site for metastatic spread of ovarian cancer via fluid in peritoneal cavity	363, 364
Urinary System		
Urinary bladder	Degree of filling is readily assessed with ultrasound; in patients with poor urine output, this can establish diagnosis of bladder outlet obstruction	368, 369
Ureteric orifice	Abnormal reflux of urine from urinary bladder to ureters (vesicoureteral reflux) may occur in children, contributing to recurrent urinary infections and progressive renal fibrosis	371
Ureter	Enlargement indicates obstruction of ureter or urinary bladder; impaction of renal stone in ureter causes severe pain and, in some cases, hematuria; ureter may be injured during hysterectomy because of its close relationship to uterine artery	335, 336, 402
Reproductive System		
Rectouterine pouch (of Douglas)	Region examined with ultrasound to detect presence of abdominopelvic fluid; common site of ectopic pregnancy; may be accessed via posterior vaginal fornix; normally contains small, physiologic amount of peritoneal fluid	364, 365
Uterus	Site of fetal gestation; palpated during prenatal examinations to assess fetal growth; can also contain large, sometimes painful growths known as leiomyomas (fibroids)	364, 374
Uterine tubes (fallopian)	Common site of ectopic pregnancy; inflammation (salpingitis) may occur in pelvic inflammatory disease (PID), the result of sexually transmitted infection, possibly leading to fibrosis and infertility; surgical occlusion (tubal ligation) is performed when women desire permanent contraception	363, 364, 375
Cervix of uterus	Epithelium of transformation zone of cervix is prone to dysplasia and malignancy; cells are sampled from this region during Pap smear examination and tested for infection with human papillomavirus, the leading risk factor for cervical malignancy	372, 374
Vagina	Posterior part of vaginal fornix allows access to rectouterine pouch (of Douglas)	364
Ovary	Examined with ultrasound to identify cysts, or for oocyte collection; torsion is painful condition that occurs when ovary twists on axis of suspensory ligament of ovary, occluding ovarian vessels and causing engorgement and ischemia	363, 374, 375
Testis	Torsion is painful condition that occurs when testis twists on axis of testicular vasculature, causing engorgement and ischemia	388

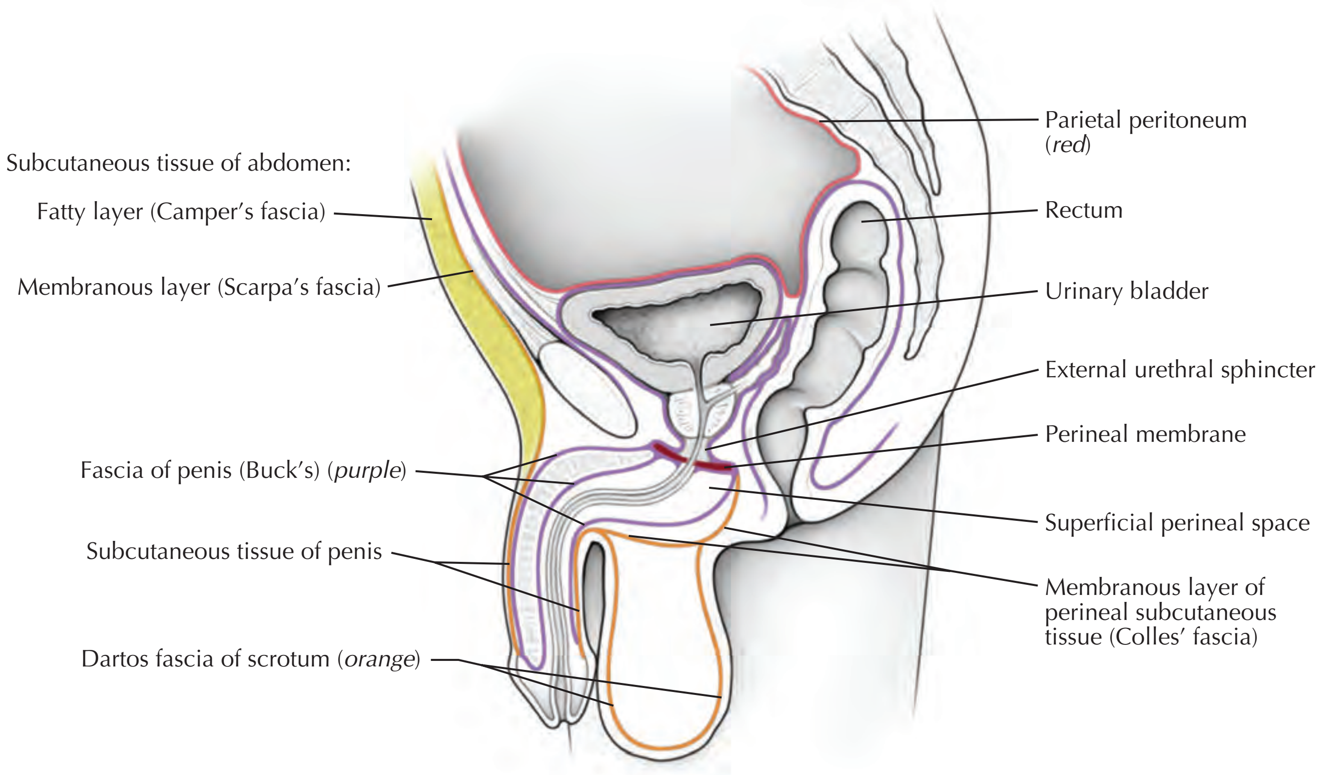
ANATOMICAL STRUCTURE	CLINICAL COMMENT	PLATE NUMBERS
Prostate	Prone to benign hypertrophy with aging, which results in urinary outflow obstruction; prostate cancer is second most common cancer in men	368, 385
Ductus deferens	Ligation (vasectomy) performed when men desire permanent contraception	368, 388

*Selections were based largely on clinical data and commonly discussed clinical correlations in macroscopic ("gross") anatomy courses.

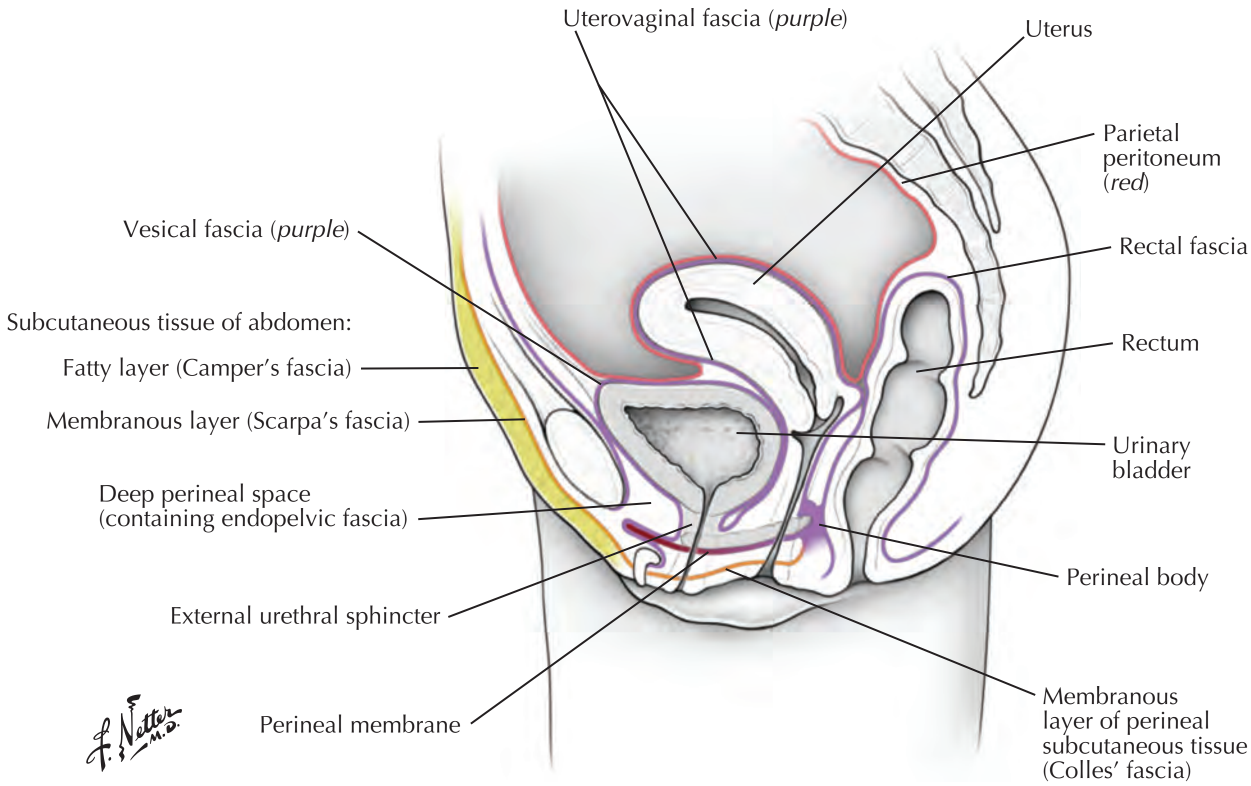
MUSCLE	MUSCLE GROUP	ORIGIN ATTACHMENT	INSERTION ATTACHMENT	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Bulbospongiosus m.	Perineal	*Male:* perineal body *Female:* perineal body	*Male:* perineal membrane, corpus cavernosum, bulb of penis *Female:* dorsum of clitoris, perineal membrane, bulb of vestibule, pubic arch	Perineal nerve	Perineal artery	*Male:* compresses bulb of penis, forces blood into body of penis during erection, propels urine and semen through urethra *Female:* constricts vaginal orifice, assists in expressing secretions of greater vestibular gland, forces blood into body of clitoris
Coccygeus m.	Pelvic diaphragm	Ischial spine	Inferior sacrum, coccyx	Nerve to coccygeus muscle	Inferior gluteal artery	Supports pelvic viscera
Compressor urethrae (female only)	Perineal	Ischiopubic ramus	Merges with contralateral partner anterior to urethra	Perineal nerve	Perineal artery	Sphincter of urethra
Cremaster	Spermatic cord	Inferior edge of internal abdominal oblique muscle, middle of inguinal ligament	Pubic tubercle, crest of pubis	Genital branch of genitofemoral nerve	Cremasteric artery	Retracts testis
Deep transverse perineal m.	Perineal	Internal surface of ramus of ischium, ischial tuberosity	Perineal body	Perineal nerve	Perineal artery	Stabilizes perineal body, supports prostate/vagina
External anal sphincter	Perineal	Anococcygeal ligament	Perineal body	Perineal and inferior anal nerves	Inferior anorectal and perineal arteries	Closes anal orifice
External urethral sphincter	Perineal	Ischiopubic ramus	*Male:* median raphe in front and behind urethra *Female:* encloses urethra, attaches to sides of vagina	Perineal nerve	Perineal artery	Compresses urethra at end of micturition; in female also compresses distal vagina
Ischiocavernosus m.	Perineal	Inferior internal surface of ramus of ischium, ischial tuberosity	*Male:* anterior end of crus of penis or clitoris *Female:* anterior end of crus of clitoris	Perineal nerve	Perineal artery	Forces blood into body of penis and clitoris during erection
Levator ani (iliococcygeus, pubococcygeus, and puboanalis) mm.	Pelvic diaphragm	Body of pubis, tendinous arch of levator ani (on obturator fascia), ischial spine	Perineal body, coccyx, raphe of pelvic diaphragm, walls of prostate or vagina, anorectal junction	Nerve to levator ani, perineal nerve	Inferior gluteal artery, internal pudendal artery and its branches (inferior anorectal and perineal arteries)	Supports pelvic viscera, elevates pelvic floor
Sphincter urethrovaginalis (female only)	Perineal	Perineal body	Passes anteriorly around urethra and merges with its contralateral partner	Perineal nerve	Perineal artery	Sphincter of urethra and vagina
Superficial transverse perineal m.	Perineal	Ramus of ischium, ischial tuberosity	Perineal body	Perineal nerve	Perineal artery	Stabilizes perineal body

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.

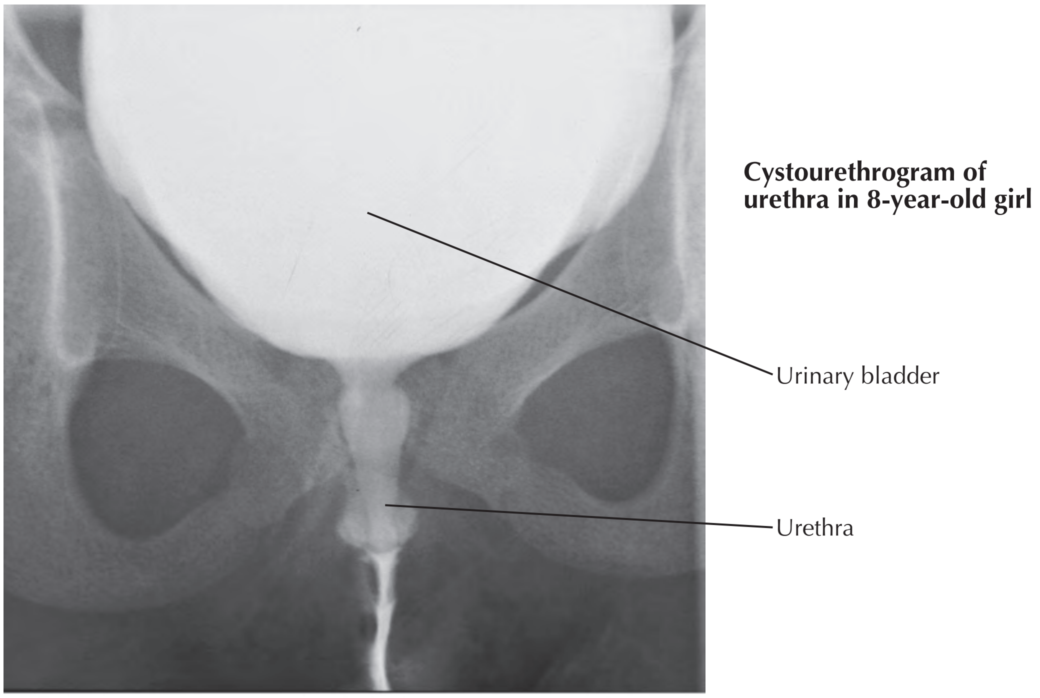
Fasciae of Pelvis and Perineum: Male and Female

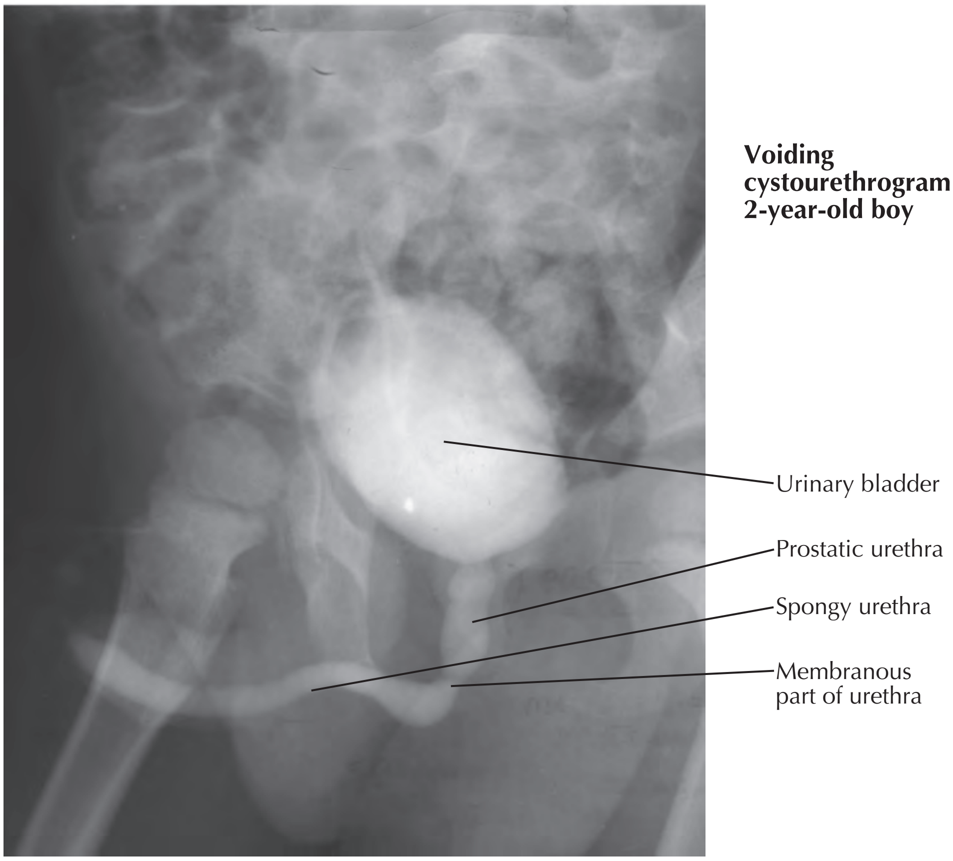

Subcutaneous tissue of abdomen:
Fatty layer (Camper's fascia)
Membranous layer (Scarpa's fascia)
Fascia of penis (Buck's) (*purple*)
Subcutaneous tissue of penis
Dartos fascia of scrotum (*orange*)
Parietal peritoneum (*red*)
Rectum
Urinary bladder
External urethral sphincter
Perineal membrane
Superficial perineal space
Membranous layer of perineal subcutaneous tissue (Colles' fascia)

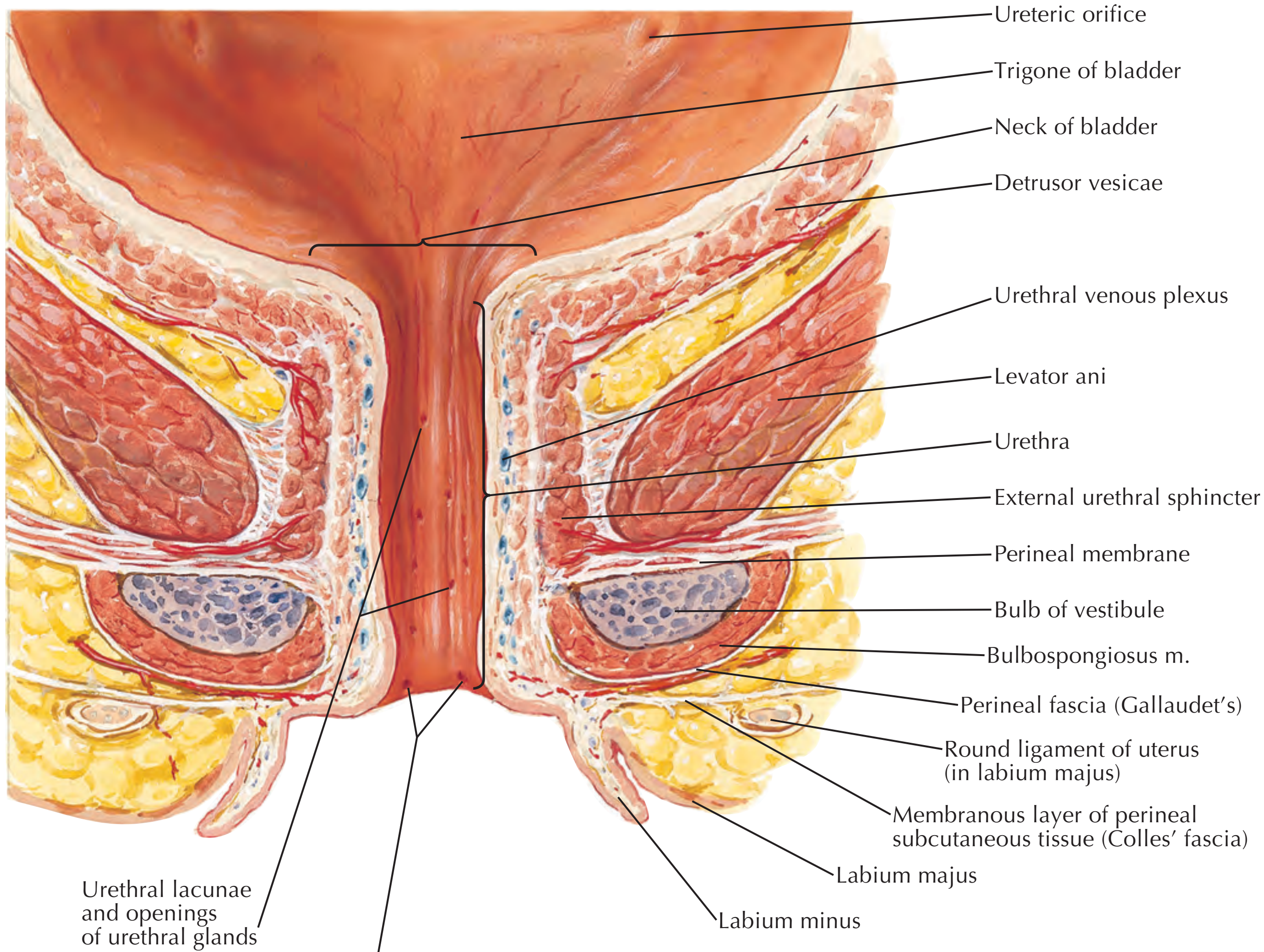
Median section of male


Uterovaginal fascia (*purple*)
Uterus
Parietal peritoneum (*red*)
Rectal fascia
Rectum
Urinary bladder
Perineal body
Membranous layer of perineal subcutaneous tissue (Colles' fascia)
Vesical fascia (*purple*)
Subcutaneous tissue of abdomen:
Fatty layer (Camper's fascia)
Membranous layer (Scarpa's fascia)
Deep perineal space (containing endopelvic fascia)
External urethral sphincter
Perineal membrane
F. Netter M.D.

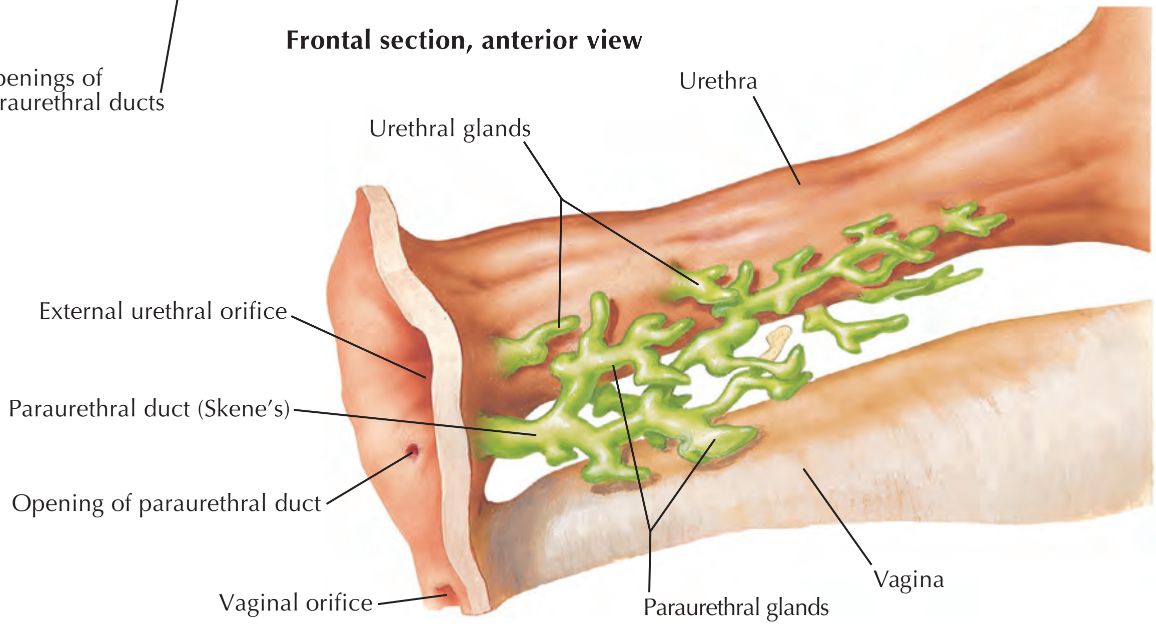
Median section of female


Cystourethrogram of urethra in 8-year-old girl
Urinary bladder
Urethra


Voiding cystourethrogram in 2-year-old boy
Urinary bladder
Prostatic urethra
Spongy urethra
Membranous part of urethra


Ureteric orifice
Trigone of bladder
Neck of bladder
Detrusor vesicae
Urethral venous plexus
Levator ani
Urethra
External urethral sphincter
Perineal membrane
Bulb of vestibule
Bulbospongiosus m.
Perineal fascia (Gallaudet's)
Round ligament of uterus (in labium majus)
Membranous layer of perineal subcutaneous tissue (Colles' fascia)
Labium majus
Labium minus
Urethral lacunae and openings of urethral glands
Openings of paraurethral ducts

Frontal section, anterior view


Urethra
Urethral glands
External urethral orifice
Paraurethral duct (Skene's)
Opening of paraurethral duct
Vaginal orifice
Paraurethral glands
Vagina

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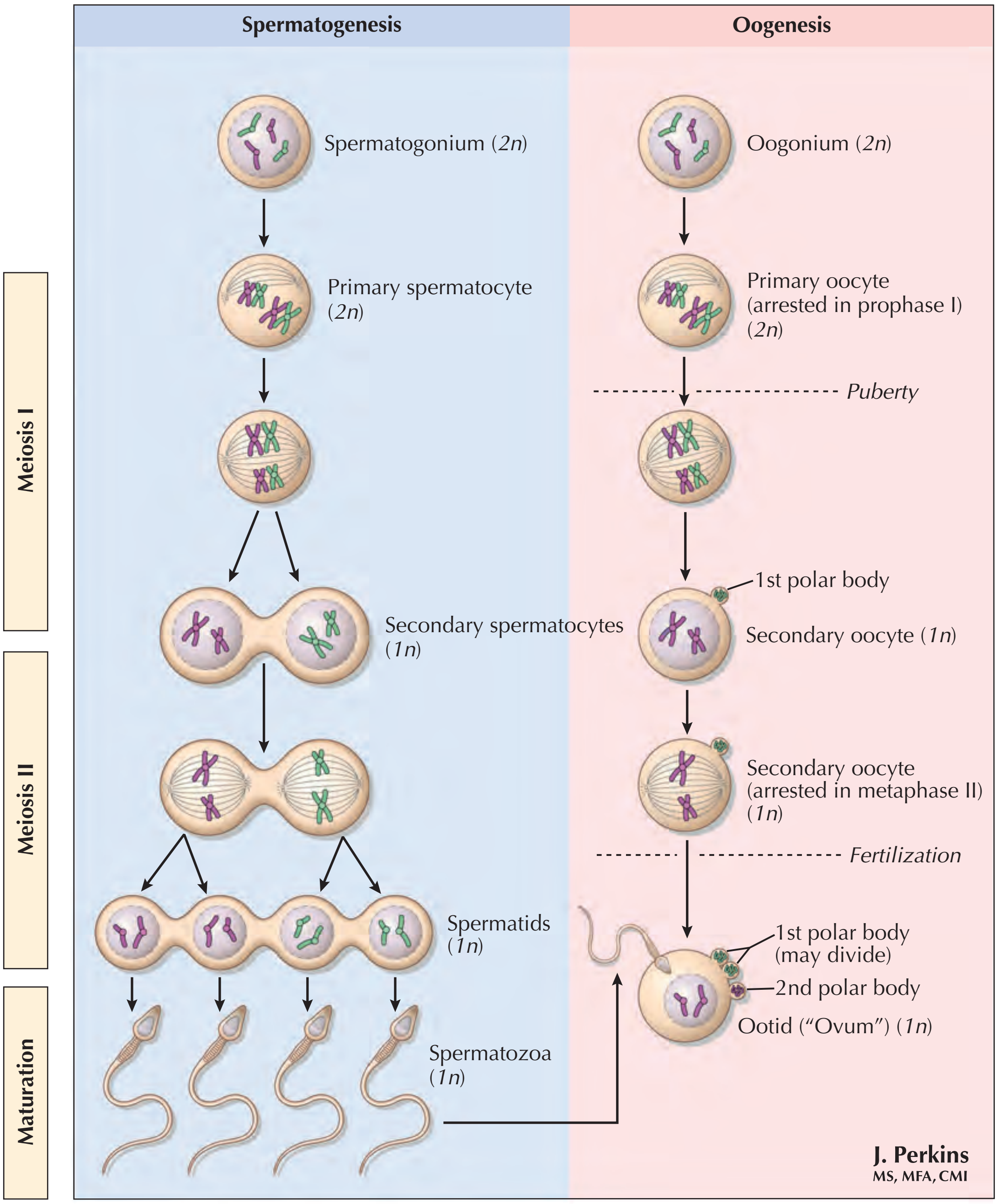
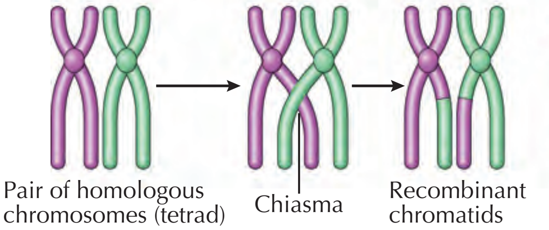
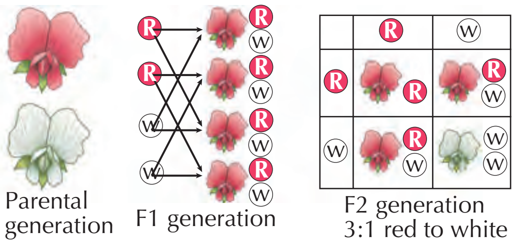
Schematic reconstruction

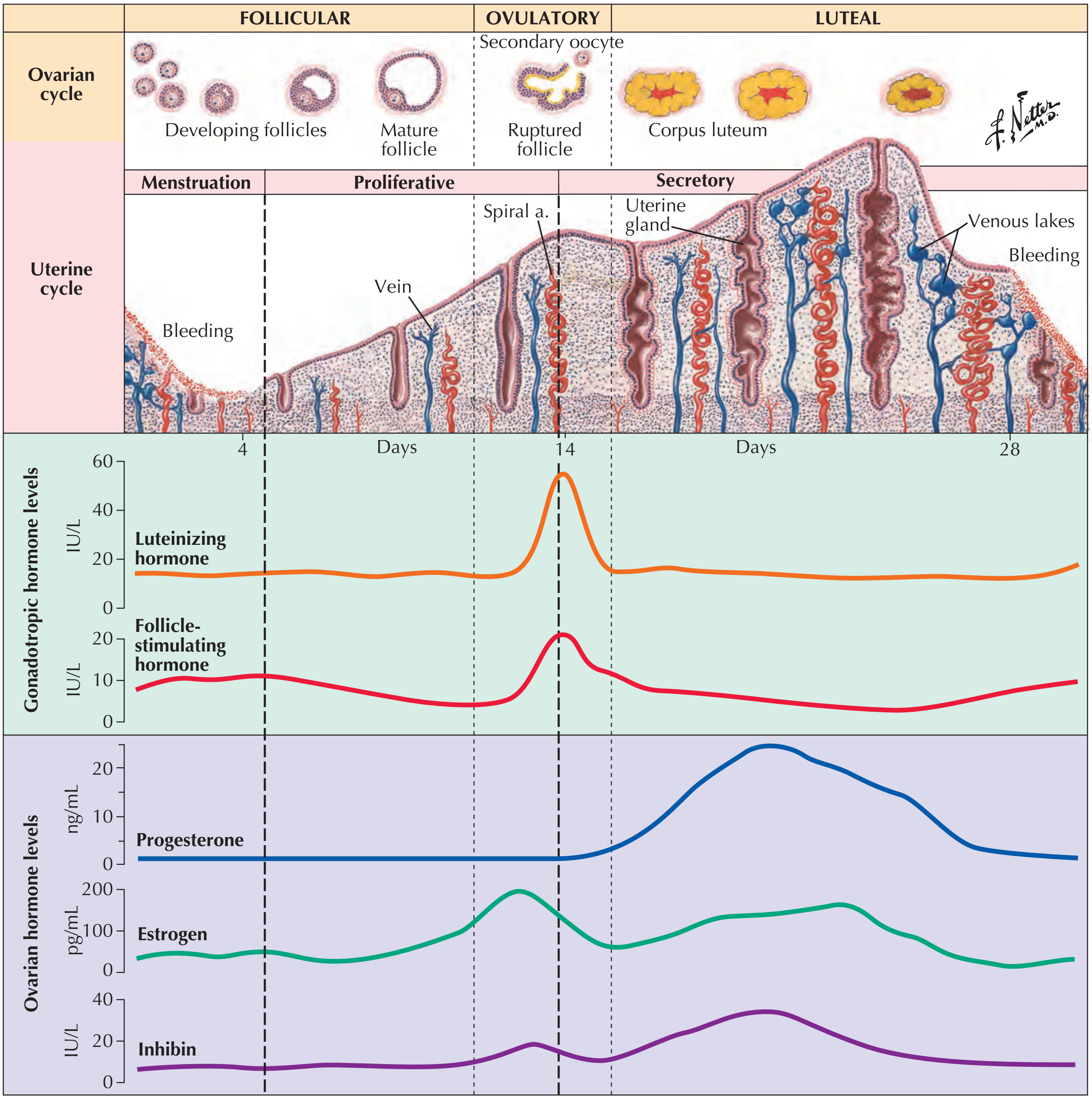

Spermatogenesis
Oogenesis
Spermatogonium (2*n*)
Oogonium (2*n*)
Primary spermatocyte (2*n*)
Primary oocyte (arrested in prophase I) (2*n*)
Puberty
Meiosis I
1st polar body
Secondary spermatocytes (1*n*)
Secondary oocyte (1*n*)
Meiosis II
Secondary oocyte (arrested in metaphase II) (1*n*)
Fertilization
Spermatids (1*n*)
1st polar body (may divide)
2nd polar body
Ootid ("Ovum") (1*n*)
Maturation
Spermatozoa (1*n*)
J. Perkins
MS, MFA, CMI

Crossing over

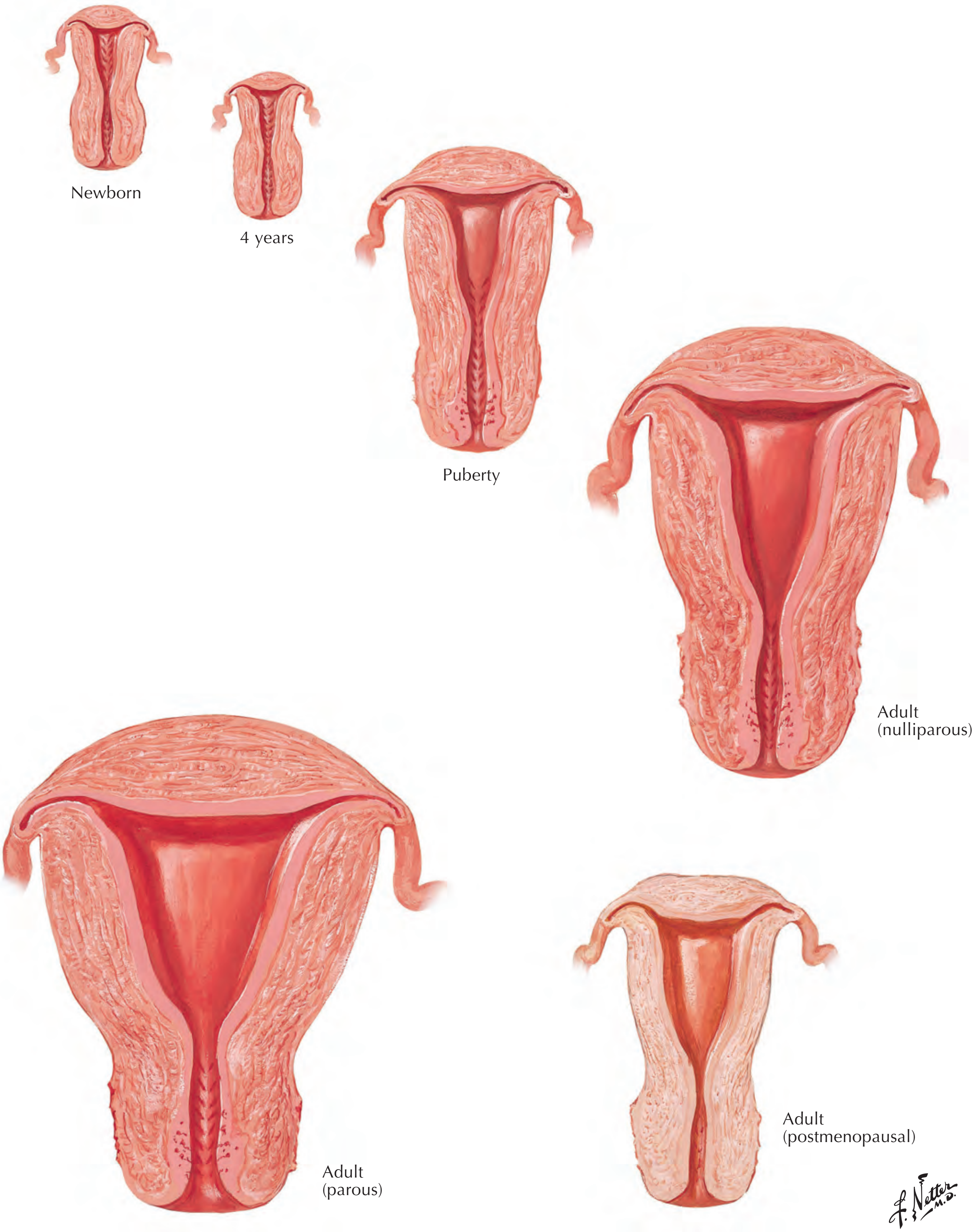

Pair of homologous chromosomes (tetrad)
Chiasma
Recombinant chromatids

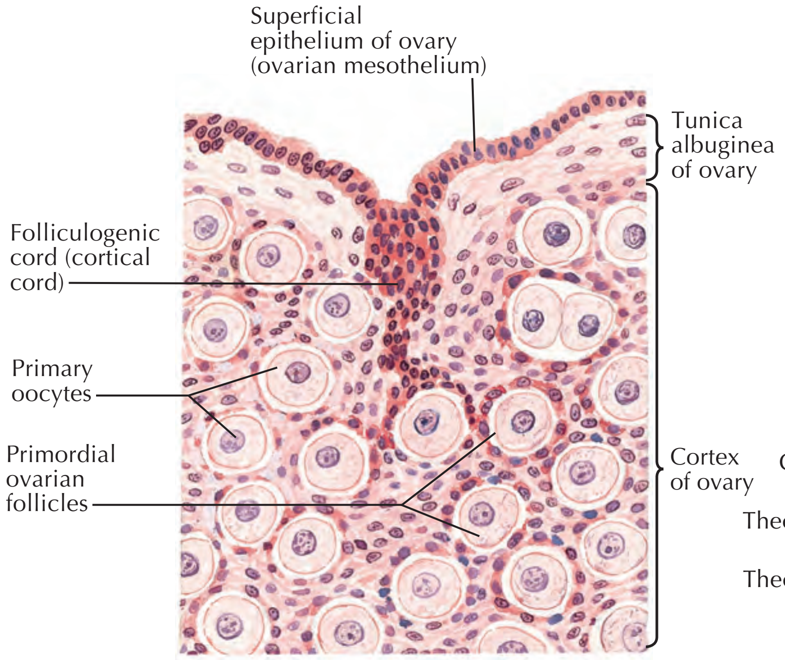
Mendelian inheritance


Parental generation
R
R
W
W
F1 generation
R
W
R
W
R
W
R
W
R
W
R
W
R
R
R
W
W
R
W
W
W
F2 generation
3:1 red to white

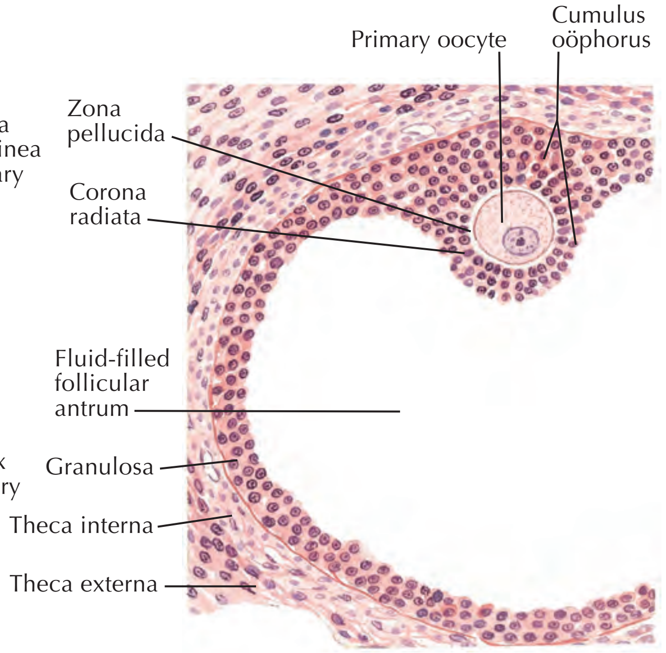

FOLLICULAR
OVULATORY
LUTEAL
Ovarian cycle
Secondary oocyte
Developing follicles
Mature follicle
Ruptured follicle
Corpus luteum
Menstruation
Proliferative
Secretory
Uterine cycle
Spiral a.
Uterine gland
Venous lakes
Bleeding
Vein
Bleeding
4
Days
14
Days
28
Gonadotropic hormone levels
60
40
20
0
IU/L
Luteinizing hormone
20
10
0
IU/L
Follicle-stimulating hormone
Ovarian hormone levels
20
10
0
ng/mL
Progesterone
200
100
0
pg/mL
Estrogen
40
20
0
IU/L
Inhibin

Uterine Development

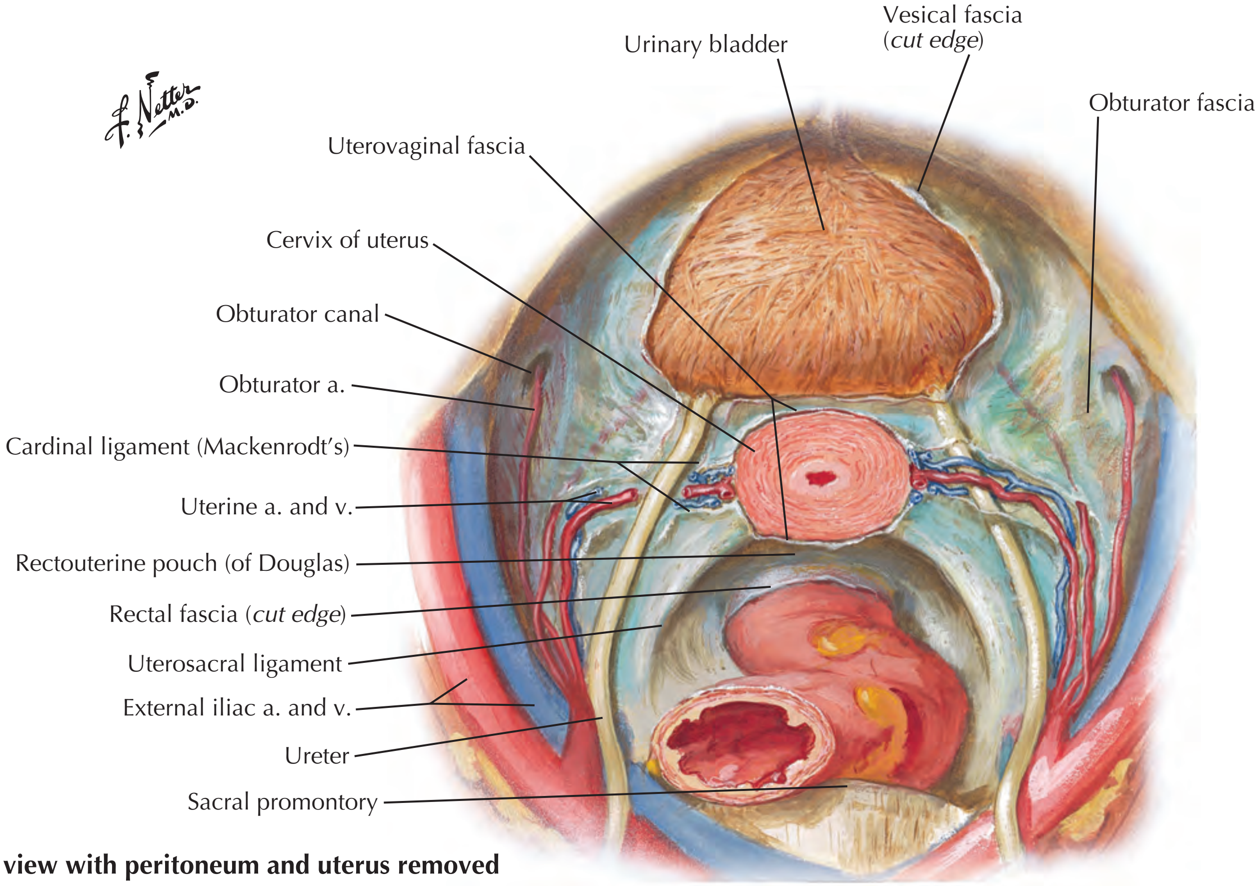

Newborn
4 years
Puberty
Adult
(nulliparous)
Adult
(parous)
Adult
(postmenopausal)


Superficial epithelium of ovary (ovarian mesothelium)
Tunica albuginea of ovary
Folliculogenic cord (cortical cord)
Primary oocytes
Primordial ovarian follicles
Cortex of ovary

Infant ovary

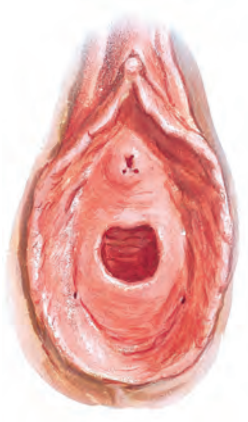

Primary oocyte
Cumulus oöphorus
Zona pellucida
Corona radiata
Fluid-filled follicular antrum
Granulosa
Theca interna
Theca externa

Maturing follicle

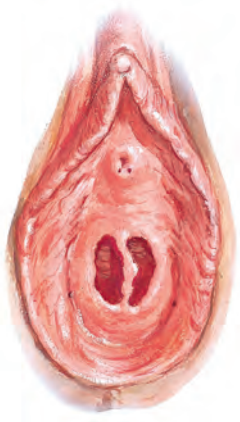

Urinary bladder
Vesical fascia (cut edge)
Obturator fascia
Uterovaginal fascia
Cervix of uterus
Obturator canal
Obturator a.
Cardinal ligament (Mackenrodt's)
Uterine a. and v.
Rectouterine pouch (of Douglas)
Rectal fascia (cut edge)
Uterosacral ligament
External iliac a. and v.
Ureter
Sacral promontory
F. Netter M.D.

Superior view with peritoneum and uterus removed

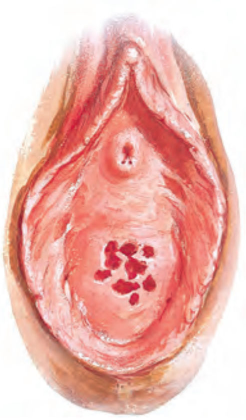
Variations in Hymen



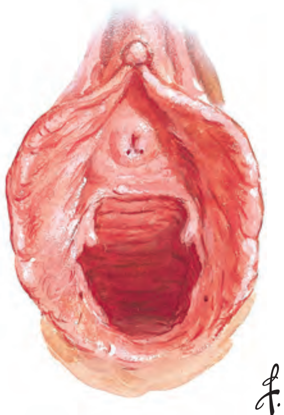
Annular hymen



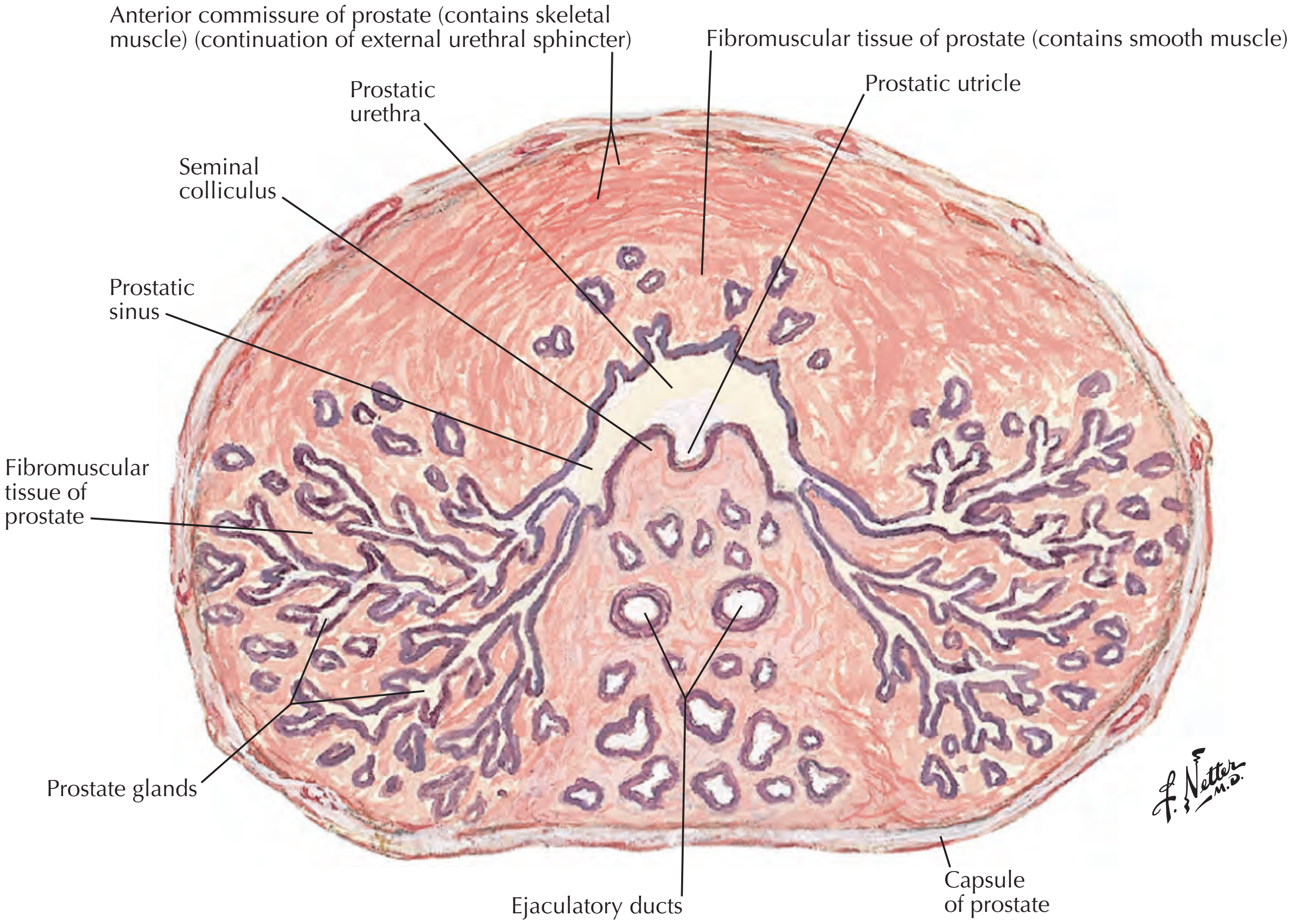
Septate hymen

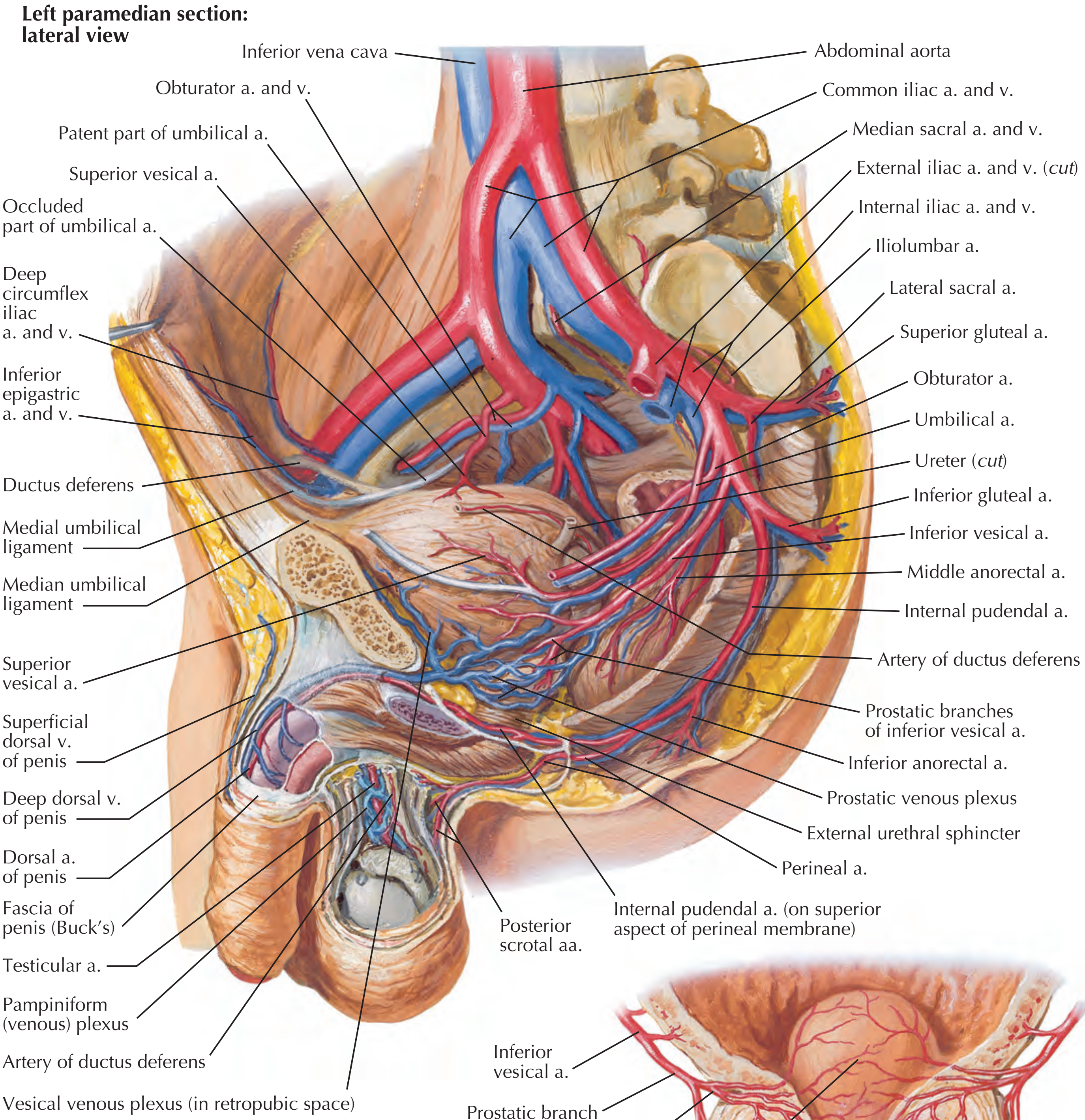


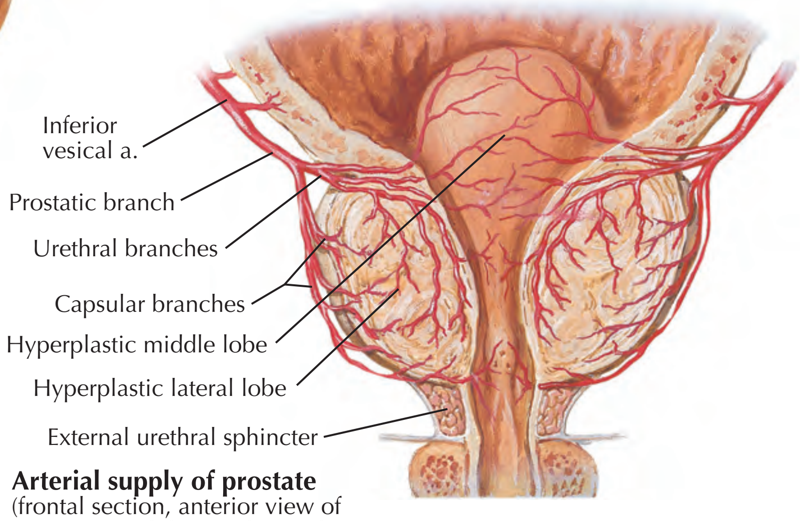
Cribriform hymen



Parous introitus


Anterior commissure of prostate (contains skeletal muscle) (continuation of external urethral sphincter)
Fibromuscular tissue of prostate (contains smooth muscle)
Prostatic urethra
Prostatic utricle
Seminal colliculus
Prostatic sinus
Fibromuscular tissue of prostate
Prostate glands
Ejaculatory ducts
Capsule of prostate
F. Netter M.D.

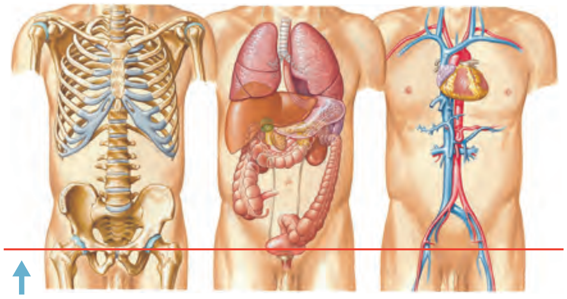

Left paramedian section: lateral view
Inferior vena cava
Obturator a. and v.
Patent part of umbilical a.
Superior vesical a.
Occluded part of umbilical a.
Deep circumflex iliac a. and v.
Inferior epigastric a. and v.
Ductus deferens
Medial umbilical ligament
Median umbilical ligament
Superior vesical a.
Superficial dorsal v. of penis
Deep dorsal v. of penis
Dorsal a. of penis
Fascia of penis (Buck's)
Testicular a.
Pampiniform (venous) plexus
Artery of ductus deferens
Vesical venous plexus (in retropubic space)
Abdominal aorta
Common iliac a. and v.
Median sacral a. and v.
External iliac a. and v. (cut)
Internal iliac a. and v.
Iliolumbar a.
Lateral sacral a.
Superior gluteal a.
Obturator a.
Umbilical a.
Ureter (cut)
Inferior gluteal a.
Inferior vesical a.
Middle anorectal a.
Internal pudendal a.
Artery of ductus deferens
Prostatic branches of inferior vesical a.
Inferior anorectal a.
Prostatic venous plexus
External urethral sphincter
Perineal a.
Internal pudendal a. (on superior aspect of perineal membrane)
Posterior scrotal aa.

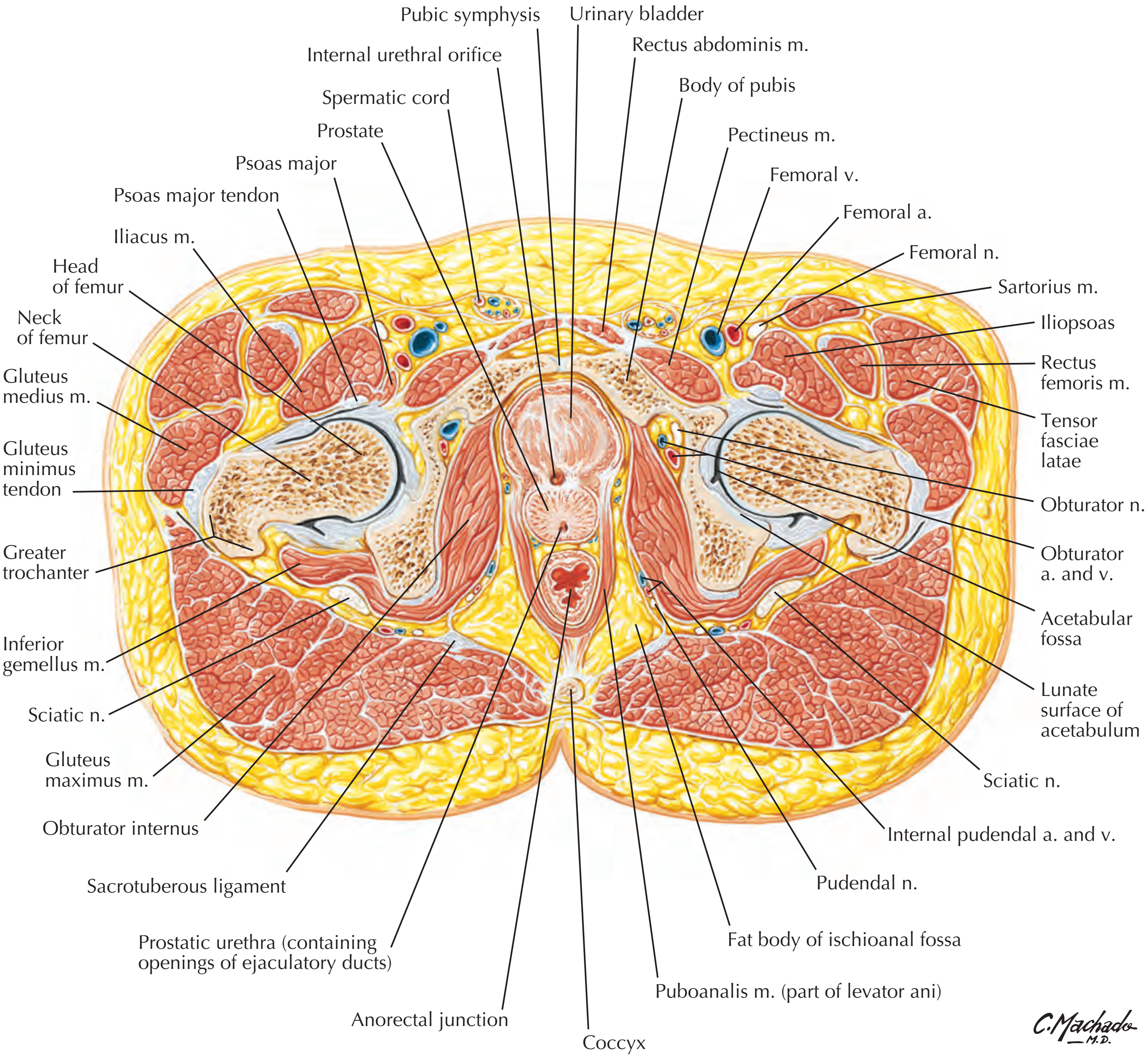

Inferior vesical a.
Prostatic branch
Urethral branches
Capsular branches
Hyperplastic middle lobe
Hyperplastic lateral lobe
External urethral sphincter

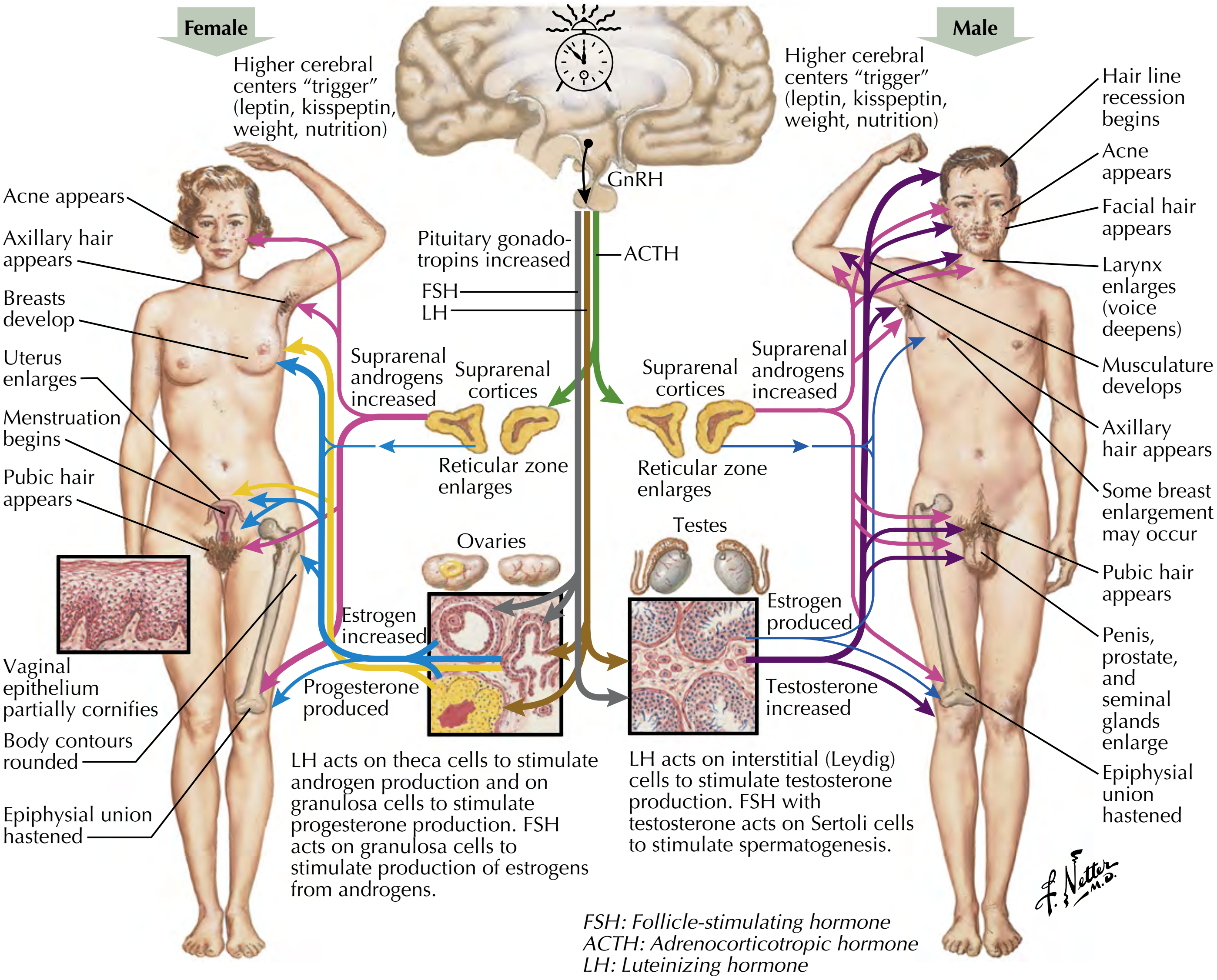
Arterial supply of prostate
(frontal section, anterior view of specimen with benign hyperplasia)

F. Netter M.D.
C. Machado M.D.

Cross Section of Lower Pelvis




Pubic symphysis
Urinary bladder
Internal urethral orifice
Rectus abdominis m.
Spermatic cord
Body of pubis
Prostate
Pectineus m.
Psoas major
Femoral v.
Psoas major tendon
Femoral a.
Iliacus m.
Femoral n.
Head of femur
Sartorius m.
Neck of femur
Iliopsoas
Gluteus medius m.
Rectus femoris m.
Tensor fasciae latae
Gluteus minimus tendon
Obturator n.
Greater trochanter
Obturator a. and v.
Acetabular fossa
Inferior gemellus m.
Lunate surface of acetabulum
Sciatic n.
Gluteus maximus m.
Sciatic n.
Obturator internus
Internal pudendal a. and v.
Sacrotuberous ligament
Pudendal n.
Prostatic urethra (containing openings of ejaculatory ducts)
Fat body of ischioanal fossa
Puboanalis m. (part of levator ani)
Anorectal junction
Coccyx
C. Machado M.D.


Female
Higher cerebral centers "trigger" (leptin, kisspeptin, weight, nutrition)
Acne appears
Axillary hair appears
Breasts develop
Uterus enlarges
Menstruation begins
Pubic hair appears
Vaginal epithelium partially cornifies
Body contours rounded
Epiphysial union hastened
GnRH
Pituitary gonado-tropins increased
FSH
LH
ACTH
Suprarenal androgens increased
Suprarenal cortices
Reticular zone enlarges
Ovaries
Estrogen increased
Progesterone produced
Male
Higher cerebral centers "trigger" (leptin, kisspeptin, weight, nutrition)
Hair line recession begins
Acne appears
Facial hair appears
Larynx enlarges (voice deepens)
Musculature develops
Axillary hair appears
Some breast enlargement may occur
Pubic hair appears
Penis, prostate, and seminal glands enlarge
Epiphysial union hastened
Suprarenal cortices
Suprarenal androgens increased
Reticular zone enlarges
Testes
Estrogen produced
Testosterone increased

LH acts on theca cells to stimulate androgen production and on granulosa cells to stimulate progesterone production. FSH acts on granulosa cells to stimulate production of estrogens from androgens.

LH acts on interstitial (Leydig) cells to stimulate testosterone production. FSH with testosterone acts on Sertoli cells to stimulate spermatogenesis.

FSH: Follicle-stimulating hormone
ACTH: Adrenocorticotropic hormone
LH: Luteinizing hormone

UPPER LIMB

7

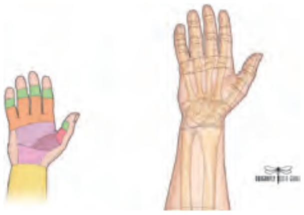
Surface Anatomy 422–426
Shoulder and Axilla 427–439
Arm 440–445
Elbow and Forearm 446–461
Wrist and Hand 462–481
Nerves and Vasculature 482–489
Regional Imaging 490
Structures with High Clinical Significance Tables 7.1–7.2
Nerves of Brachial Plexus Tables 7.3–7.4
Muscles Tables 7.5–7.8
Electronic Bonus Plates BP 96–BP 102

ELECTRONIC BONUS PLATES

BP 96 Arteries of Arm and Proximal Forearm

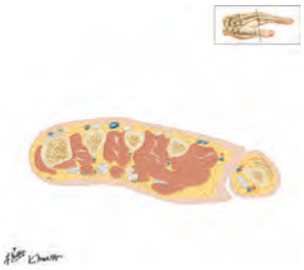
BP 97 Arteries of Forearm and Hand

BP 98 Ligaments of Wrist: Posterior and Anterior Views



BP 99 Flexor and Extensor Zones of Hand

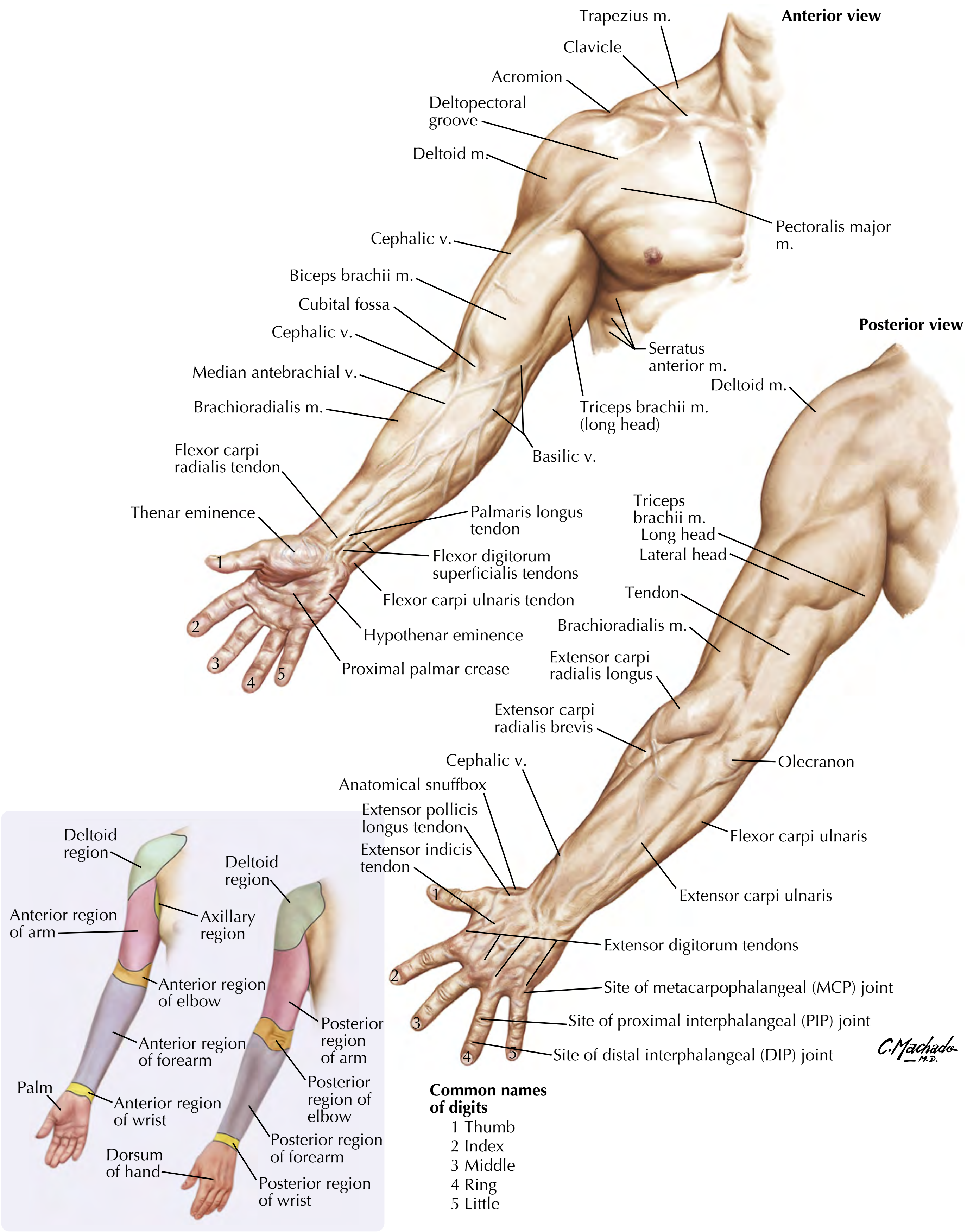
BP 100 Cross Sections Through Metacarpal and Distal Carpal Bones



BP 101 Cross Section of Hand: Axial View

BP 102 Cross Section of Hand: Axial View (Continued)

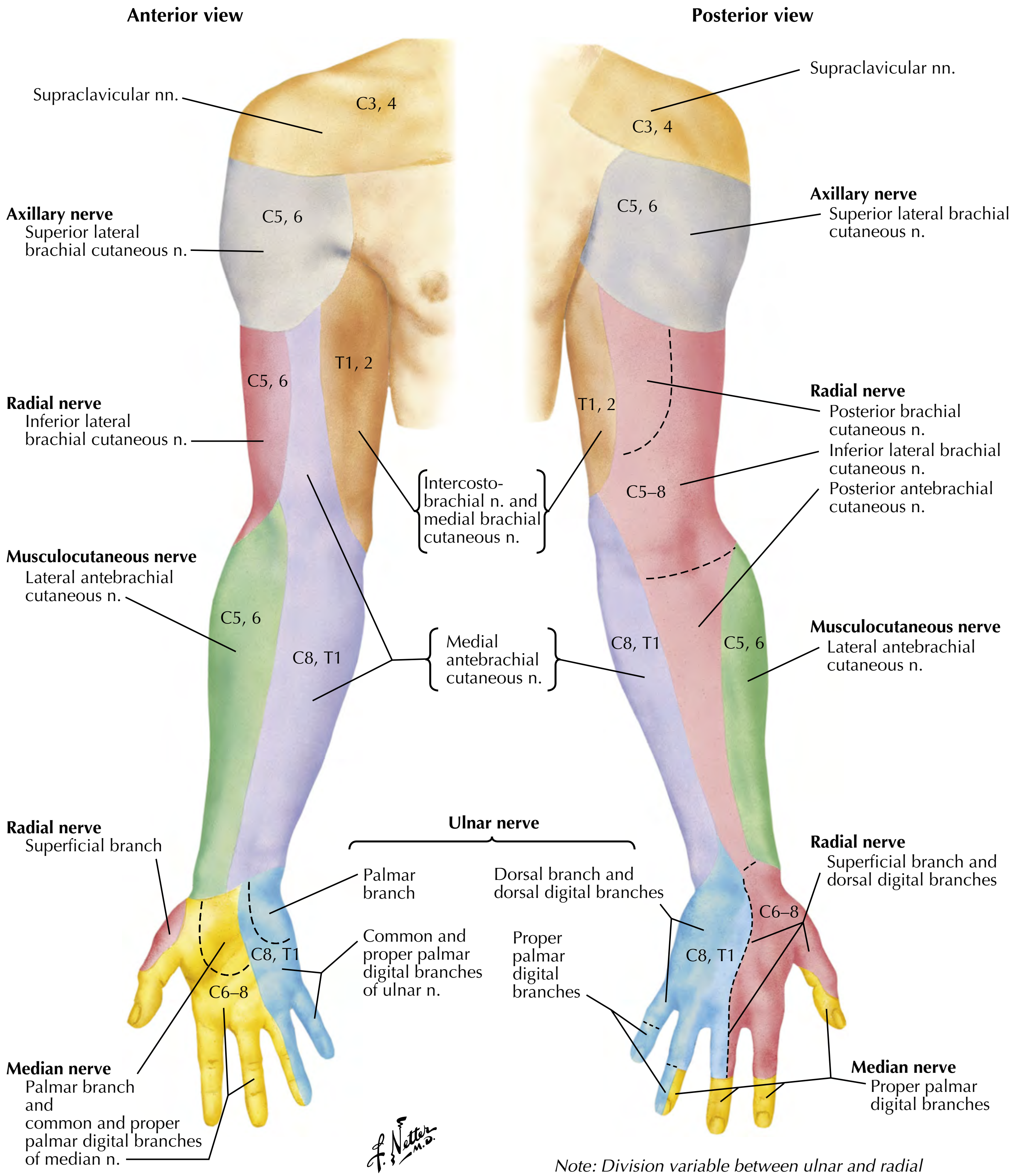
See also **Plates 5, 178, 267**


Anterior view
Trapezius m.
Clavicle
Acromion
Deltopectoral groove
Deltoid m.
Pectoralis major m.
Cephalic v.
Biceps brachii m.
Cubital fossa
Cephalic v.
Serratus anterior m.
Median antebrachial v.
Brachioradialis m.
Triceps brachii m. (long head)
Basilic v.
Flexor carpi radialis tendon
Thenar eminence
Palmaris longus tendon
Flexor digitorum superficialis tendons
Flexor carpi ulnaris tendon
Hypothenar eminence
Proximal palmar crease
1
2
3
4
5
Posterior view
Deltoid m.
Triceps brachii m.
Long head
Lateral head
Tendon
Brachioradialis m.
Extensor carpi radialis longus
Extensor carpi radialis brevis
Cephalic v.
Olecranon
Anatomical snuffbox
Extensor pollicis longus tendon
Extensor indicis tendon
Flexor carpi ulnaris
Extensor carpi ulnaris
Extensor digitorum tendons
Site of metacarpophalangeal (MCP) joint
Site of proximal interphalangeal (PIP) joint
Site of distal interphalangeal (DIP) joint
1
2
3
4
5
C. Machado M.D.
Deltoid region
Anterior region of arm
Axillary region
Anterior region of elbow
Anterior region of forearm
Palm
Anterior region of wrist
Dorsum of hand
Deltoid region
Posterior region of arm
Posterior region of elbow
Posterior region of forearm
Posterior region of wrist

Common names of digits
1 Thumb
2 Index
3 Middle
4 Ring
5 Little

Cutaneous Innervation of Upper Limb

See also **Plates 6, 482, 484**



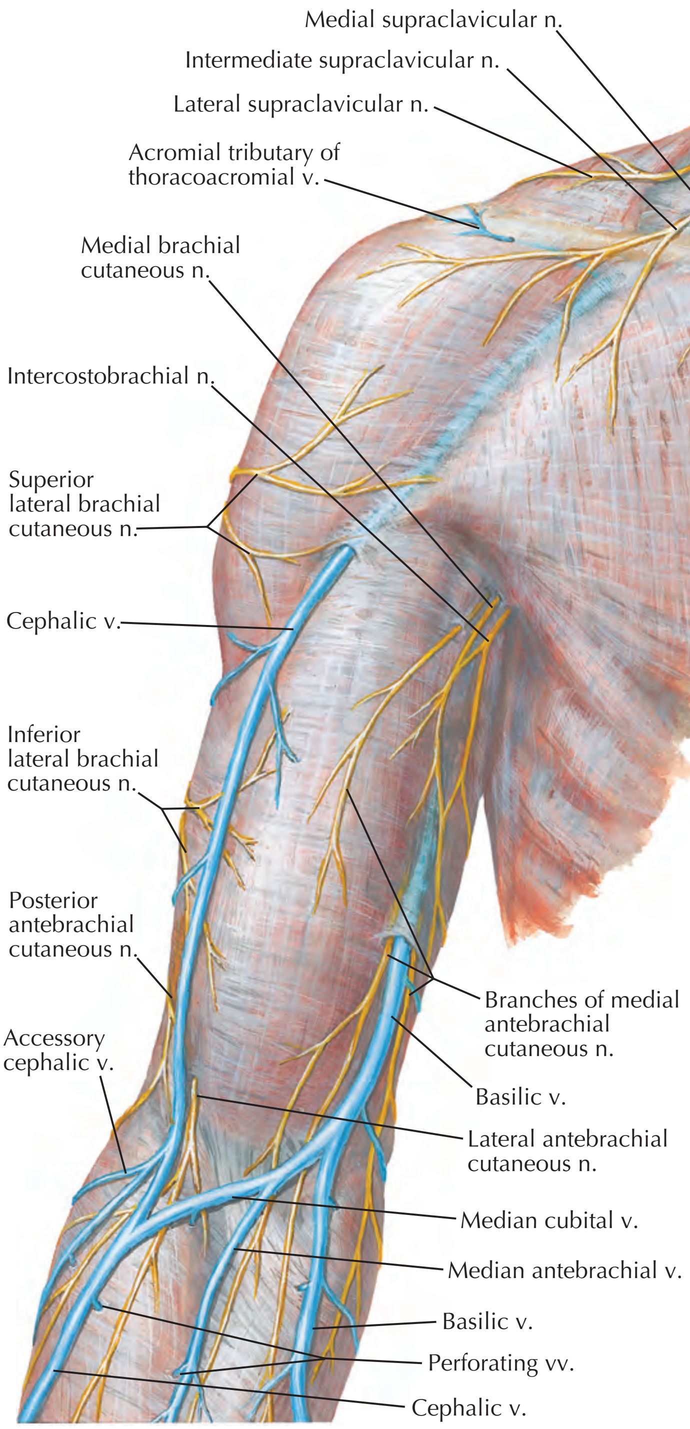
Anterior view
Posterior view
Supraclavicular nn.
C3, 4
Axillary nerve
Superior lateral brachial cutaneous n.
C5, 6
T1, 2
Radial nerve
Inferior lateral brachial cutaneous n.
Intercostobrachial n. and medial brachial cutaneous n.
Posterior brachial cutaneous n.
Posterior antebrachial cutaneous n.
C5–8
Musculocutaneous nerve
Lateral antebrachial cutaneous n.
Medial antebrachial cutaneous n.
C8, T1
Radial nerve
Superficial branch
Ulnar nerve
Palmar branch
Dorsal branch and dorsal digital branches
Common and proper palmar digital branches of ulnar n.
Proper palmar digital branches
Superficial branch and dorsal digital branches
C6–8
Median nerve
Palmar branch and common and proper palmar digital branches of median n.
Proper palmar digital branches

Note: Division variable between ulnar and radial innervation on dorsum of hand and often aligns with middle of 4th digit instead of 3rd digit as shown.

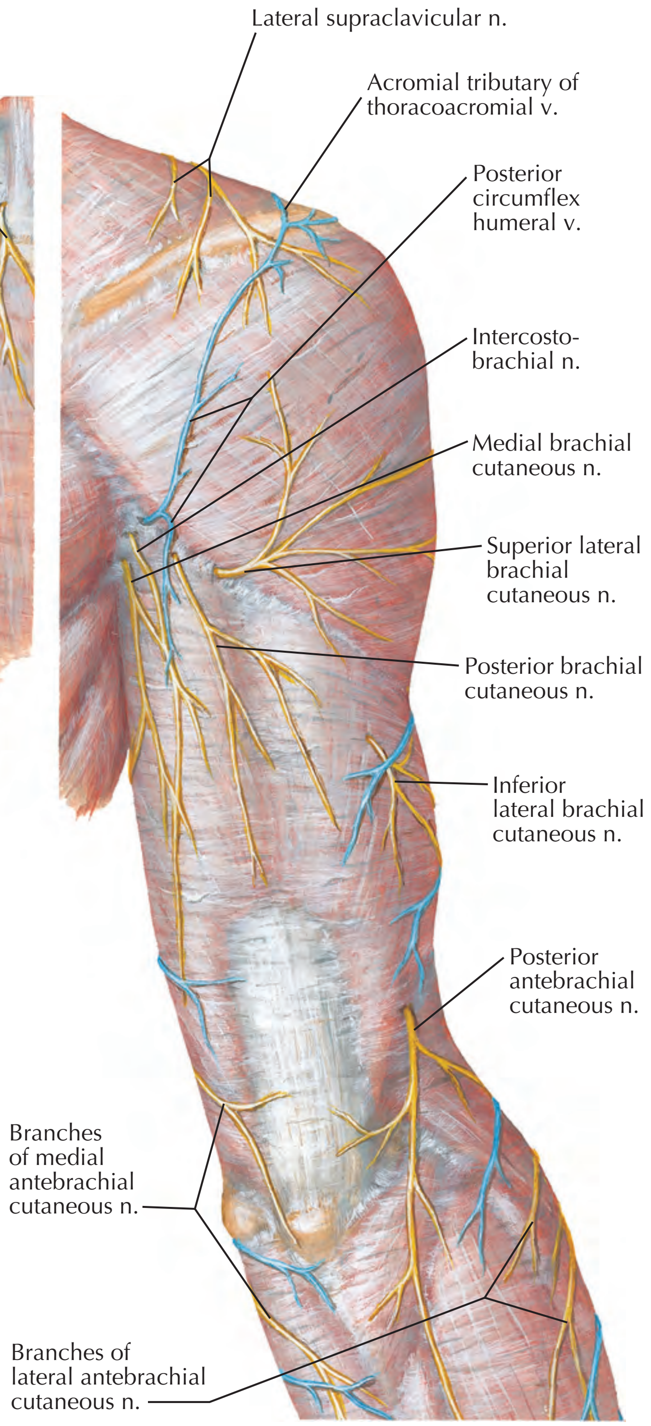
Superficial Veins of Proximal Upper Limb

See also **Plates 277, 426, 444**

Anterior view

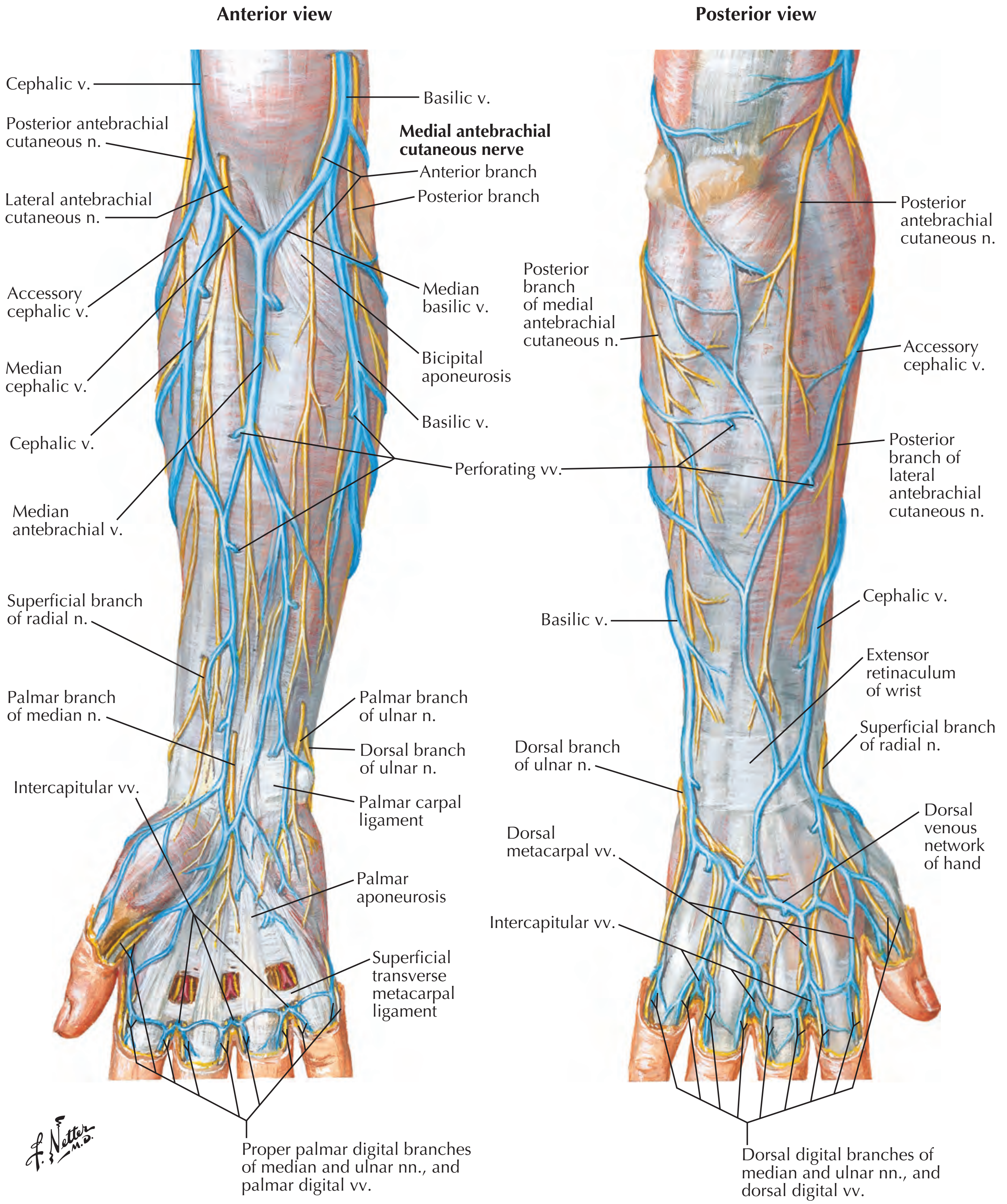

Medial supraclavicular n.
Intermediate supraclavicular n.
Lateral supraclavicular n.
Acromial tributary of thoracoacromial v.
Medial brachial cutaneous n.
Intercostobrachial n.
Superior lateral brachial cutaneous n.
Cephalic v.
Inferior lateral brachial cutaneous n.
Posterior antebrachial cutaneous n.
Accessory cephalic v.
Branches of medial antebrachial cutaneous n.
Basilic v.
Lateral antebrachial cutaneous n.
Median cubital v.
Median antebrachial v.
Basilic v.
Perforating vv.
Cephalic v.

Posterior view


Lateral supraclavicular n.
Acromial tributary of thoracoacromial v.
Posterior circumflex humeral v.
Intercosto-brachial n.
Medial brachial cutaneous n.
Superior lateral brachial cutaneous n.
Posterior brachial cutaneous n.
Inferior lateral brachial cutaneous n.
Posterior antebrachial cutaneous n.
Branches of medial antebrachial cutaneous n.
Branches of lateral antebrachial cutaneous n.

Superficial Veins of Forearm and Hand

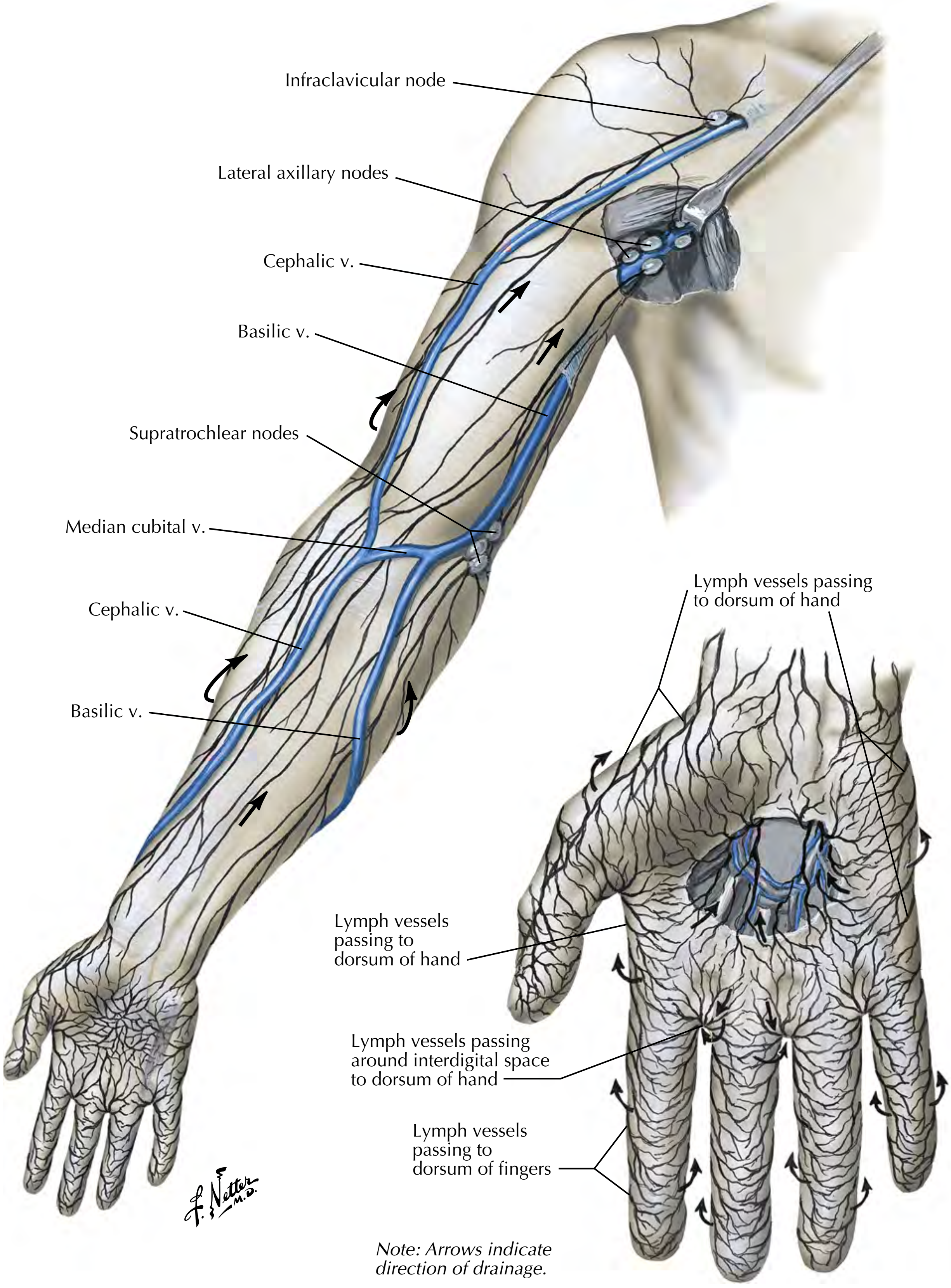
See also **Plates 423, 444, 478**


Anterior view
Posterior view
Cephalic v.
Basilic v.
Posterior antebrachial cutaneous n.
Medial antebrachial cutaneous nerve
Anterior branch
Posterior branch
Lateral antebrachial cutaneous n.
Accessory cephalic v.
Median basilic v.
Median cephalic v.
Bicipital aponeurosis
Cephalic v.
Basilic v.
Perforating vv.
Median antebrachial v.
Superficial branch of radial n.
Palmar branch of median n.
Palmar branch of ulnar n.
Dorsal branch of ulnar n.
Intercapitular vv.
Palmar carpal ligament
Palmar aponeurosis
Superficial transverse metacarpal ligament
Proper palmar digital branches of median and ulnar nn., and palmar digital vv.
Posterior antebrachial cutaneous n.
Posterior branch of medial antebrachial cutaneous n.
Accessory cephalic v.
Posterior branch of lateral antebrachial cutaneous n.
Cephalic v.
Basilic v.
Extensor retinaculum of wrist
Superficial branch of radial n.
Dorsal branch of ulnar n.
Dorsal metacarpal vv.
Dorsal venous network of hand
Intercapitular vv.
Dorsal digital branches of median and ulnar nn., and dorsal digital vv.

Note: In 70% of cases, a median cubital vein (a tributary to the basilic vein) replaces the median cephalic and median basilic veins (see Plate 424).

Lymph Vessels and Lymph Nodes of Upper Limb

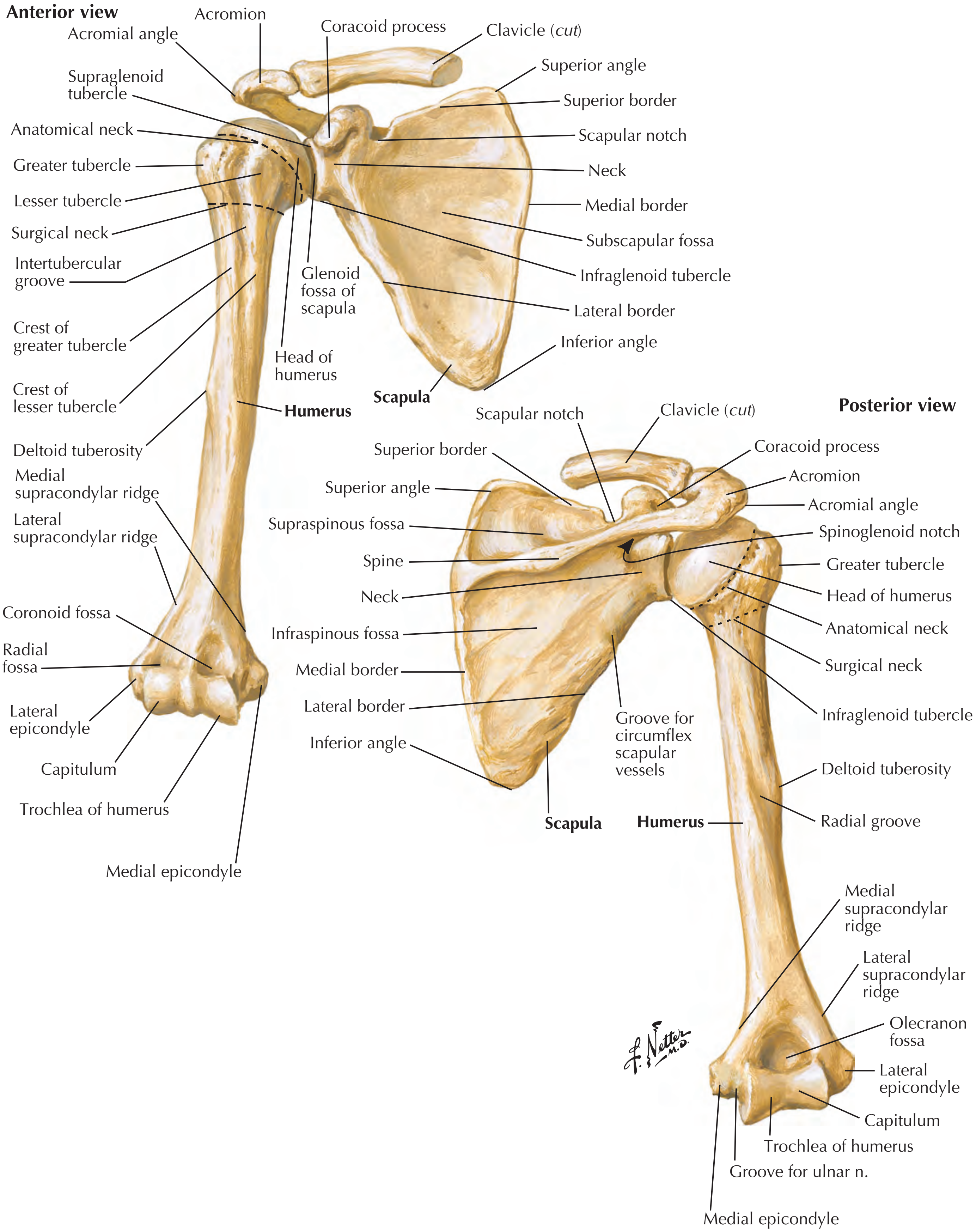
See also **Plates 208, 444, 478**


Infraclavicular node
Lateral axillary nodes
Cephalic v.
Basilic v.
Supratrochlear nodes
Median cubital v.
Cephalic v.
Basilic v.
Lymph vessels passing to dorsum of hand
Lymph vessels passing to dorsum of hand
Lymph vessels passing around interdigital space to dorsum of hand
Lymph vessels passing to dorsum of fingers
F. Netter M.D.

Note: Arrows indicate direction of drainage.

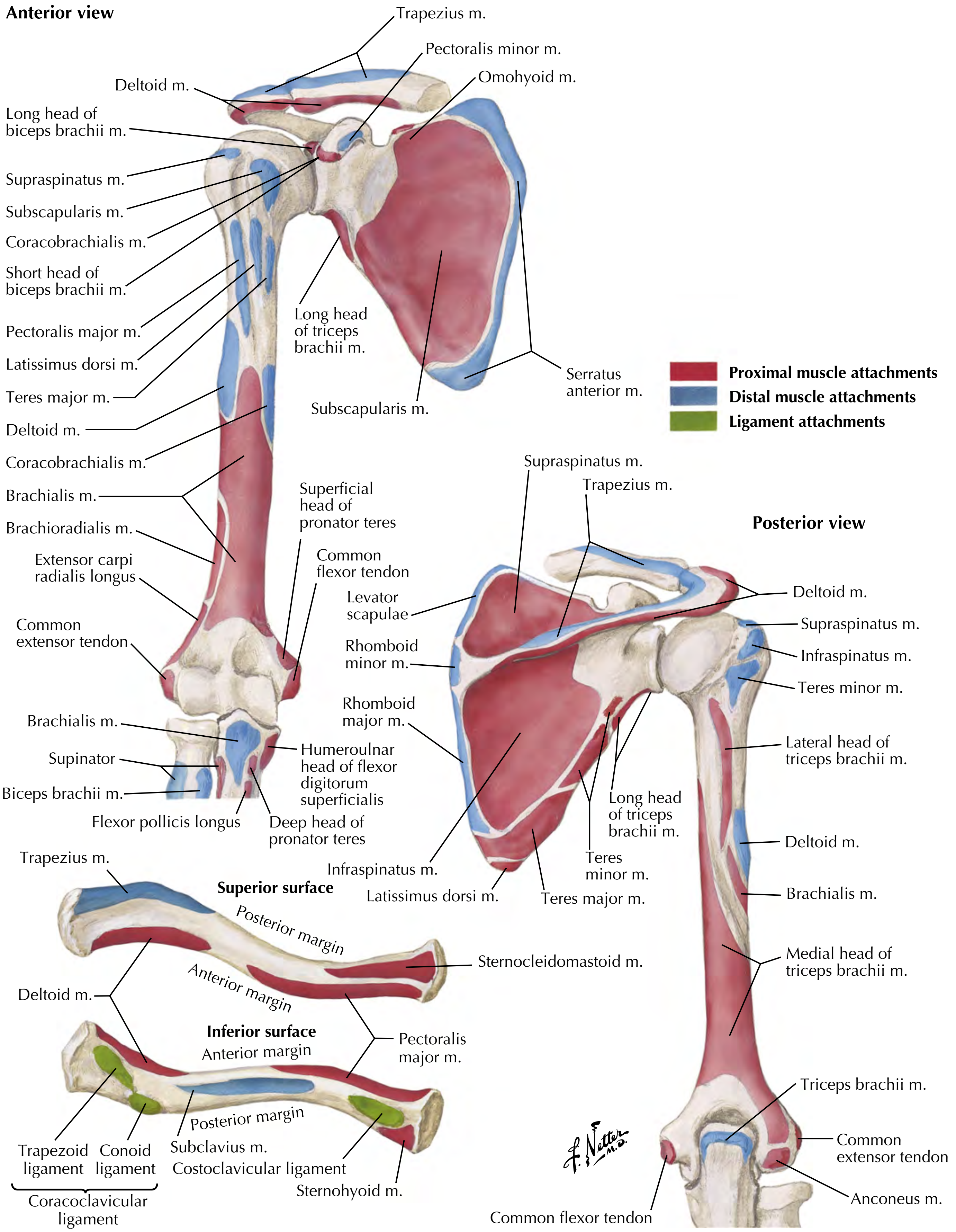
Humerus and Scapula

See also **Plates 203, 427, 428, 430**


Anterior view
Acromion
Acromial angle
Coracoid process
Clavicle (cut)
Supraglenoid tubercle
Superior angle
Superior border
Anatomical neck
Scapular notch
Greater tubercle
Neck
Lesser tubercle
Medial border
Surgical neck
Subscapular fossa
Intertubercular groove
Glenoid fossa of scapula
Infraglenoid tubercle
Lateral border
Crest of greater tubercle
Inferior angle
Head of humerus
Crest of lesser tubercle
Scapula
Humerus
Deltoid tuberosity
Medial supracondylar ridge
Lateral supracondylar ridge
Coronoid fossa
Radial fossa
Lateral epicondyle
Capitulum
Trochlea of humerus
Medial epicondyle
Posterior view
Scapular notch
Clavicle (cut)
Superior border
Coracoid process
Acromion
Superior angle
Acromial angle
Supraspinous fossa
Spinoglenoid notch
Spine
Greater tubercle
Neck
Head of humerus
Anatomical neck
Infraspinous fossa
Surgical neck
Medial border
Lateral border
Infraglenoid tubercle
Groove for circumflex scapular vessels
Inferior angle
Deltoid tuberosity
Scapula
Humerus
Radial groove
Medial supracondylar ridge
Lateral supracondylar ridge
Olecranon fossa
Lateral epicondyle
Capitulum
Trochlea of humerus
Groove for ulnar n.
Medial epicondyle

Muscle Attachment Sites of Humerus, Scapula, and Clavicle

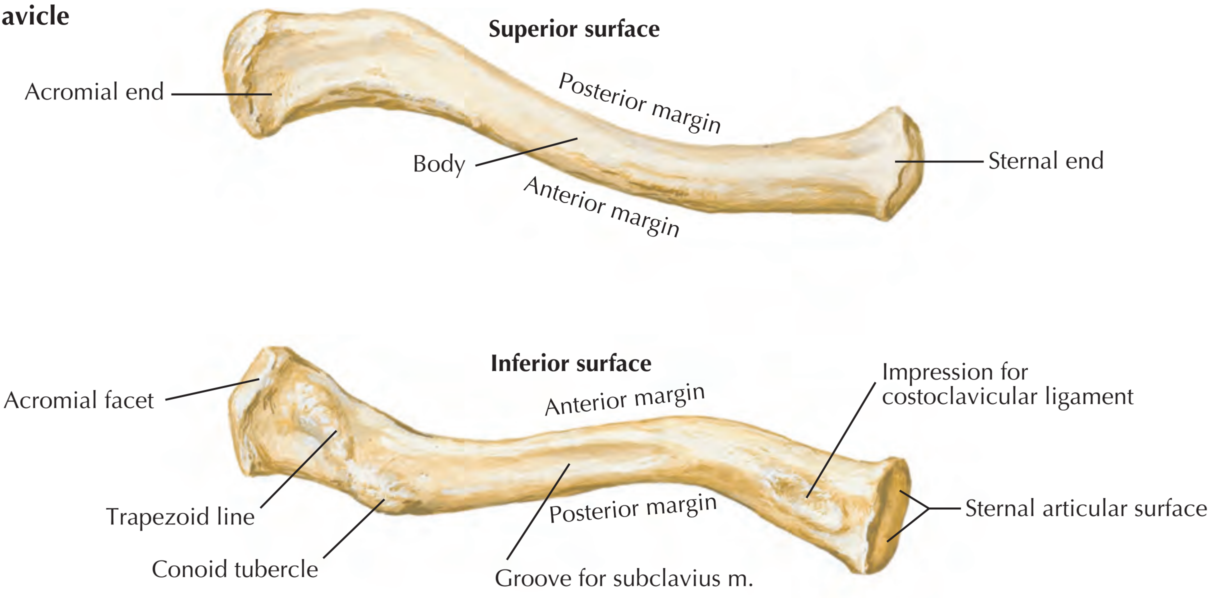
See also **Plates 203, 427, 429**


Anterior view
Trapezius m.
Pectoralis minor m.
Omohyoid m.
Deltoid m.
Long head of biceps brachii m.
Supraspinatus m.
Subscapularis m.
Coracobrachialis m.
Short head of biceps brachii m.
Pectoralis major m.
Latissimus dorsi m.
Teres major m.
Deltoid m.
Coracobrachialis m.
Brachialis m.
Brachioradialis m.
Extensor carpi radialis longus
Common extensor tendon
Long head of triceps brachii m.
Subscapularis m.
Serratus anterior m.
Superficial head of pronator teres
Common flexor tendon
Brachialis m.
Supinator
Biceps brachii m.
Flexor pollicis longus
Humeroulnar head of flexor digitorum superficialis
Deep head of pronator teres
🟥 Proximal muscle attachments
🟦 Distal muscle attachments
🟩 Ligament attachments
Posterior view
Supraspinatus m.
Trapezius m.
Levator scapulae
Rhomboid minor m.
Rhomboid major m.
Deltoid m.
Supraspinatus m.
Infraspinatus m.
Teres minor m.
Lateral head of triceps brachii m.
Long head of triceps brachii m.
Teres minor m.
Infraspinatus m.
Latissimus dorsi m.
Teres major m.
Deltoid m.
Brachialis m.
Medial head of triceps brachii m.
Triceps brachii m.
Common extensor tendon
Anconeus m.
Common flexor tendon
Trapezius m.
Superior surface
Posterior margin
Sternocleidomastoid m.
Anterior margin
Deltoid m.
Inferior surface
Anterior margin
Pectoralis major m.
Posterior margin
Trapezoid ligament
Conoid ligament
Coracoclavicular ligament
Subclavius m.
Costoclavicular ligament
Sternohyoid m.

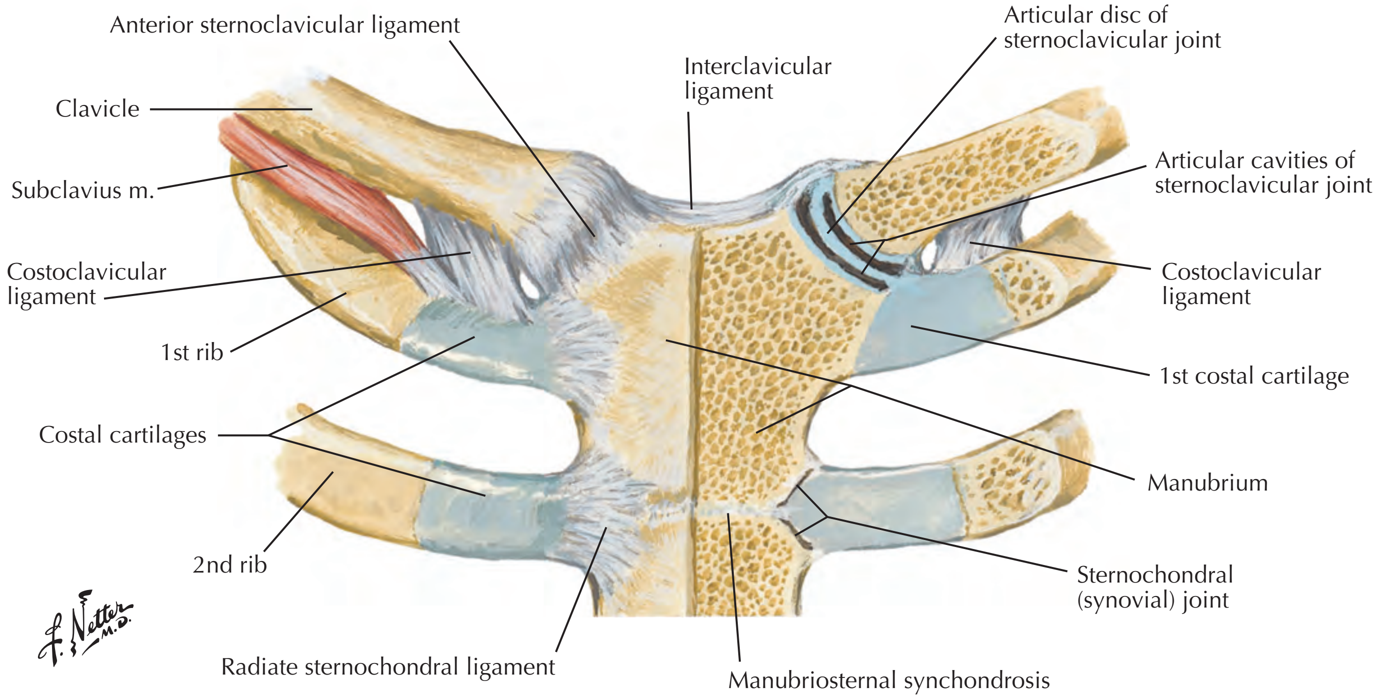
Clavicle and Sternoclavicular Joint

See also **Plates 203, 210, 427, 428**

Right clavicle

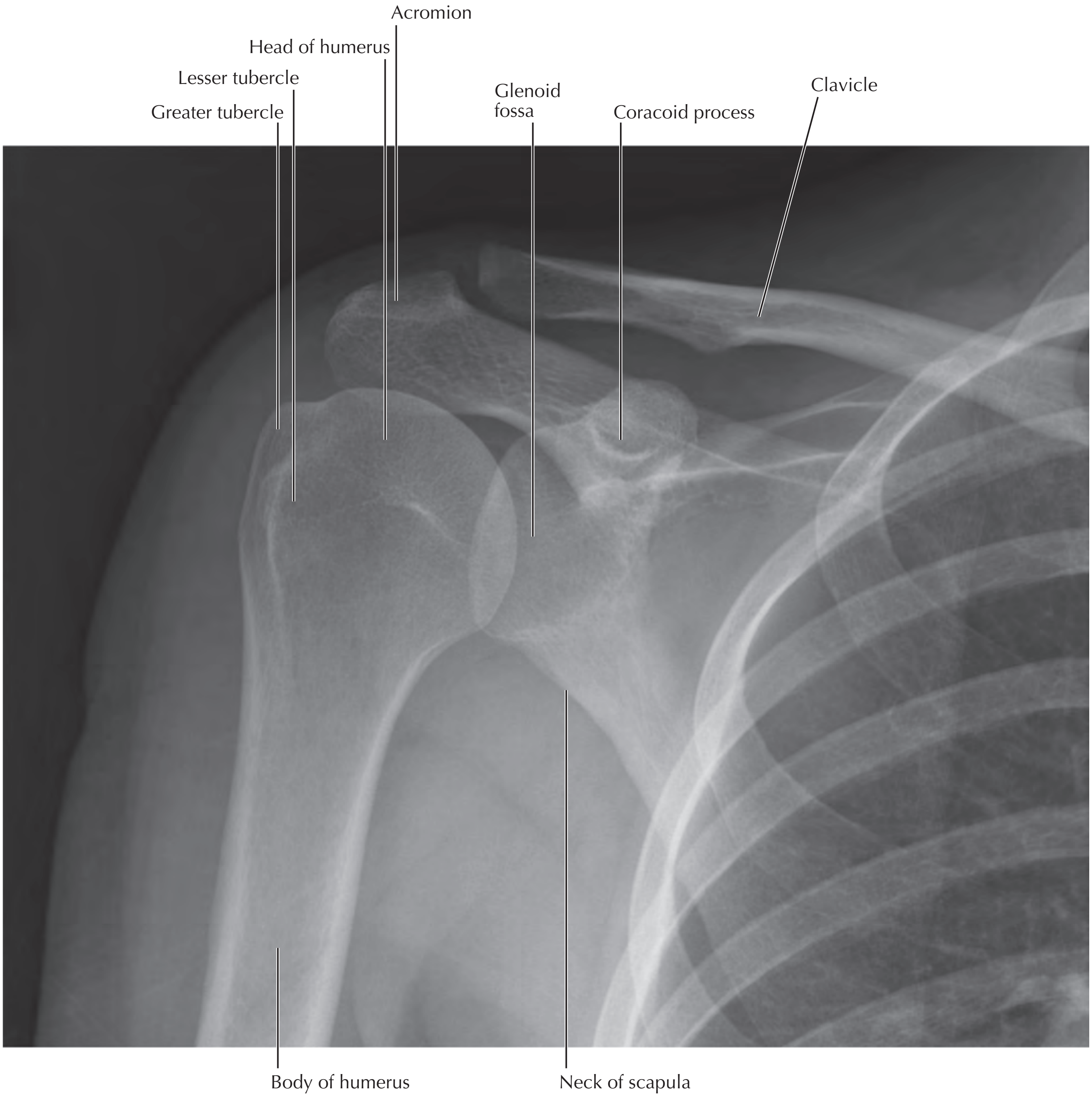

Superior surface
Acromial end
Posterior margin
Body
Sternal end
Anterior margin
Inferior surface
Acromial facet
Anterior margin
Impression for costoclavicular ligament
Trapezoid line
Posterior margin
Sternal articular surface
Conoid tubercle
Groove for subclavius m.

Sternoclavicular joint


Anterior sternoclavicular ligament
Articular disc of sternoclavicular joint
Interclavicular ligament
Clavicle
Articular cavities of sternoclavicular joint
Subclavius m.
Costoclavicular ligament
Costoclavicular ligament
1st rib
1st costal cartilage
Costal cartilages
Manubrium
2nd rib
Sternochondral (synovial) joint
Radiate sternochondral ligament
Manubriosternal synchondrosis

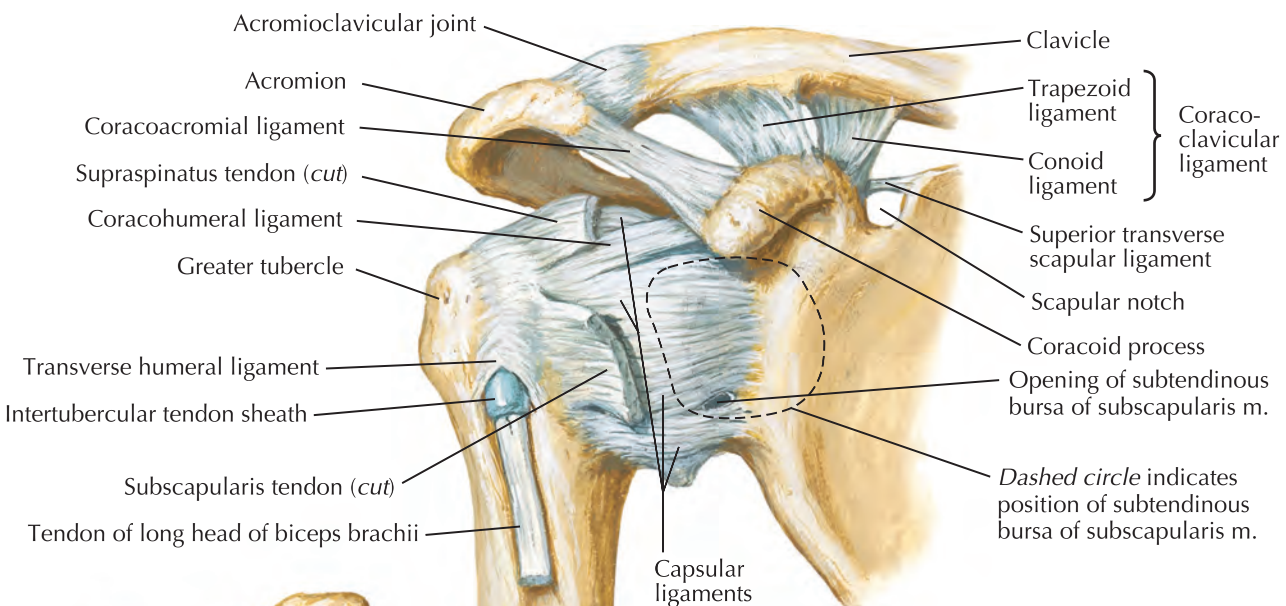
See also **Plates 427, 428, 431**

Anteroposterior radiograph of right shoulder

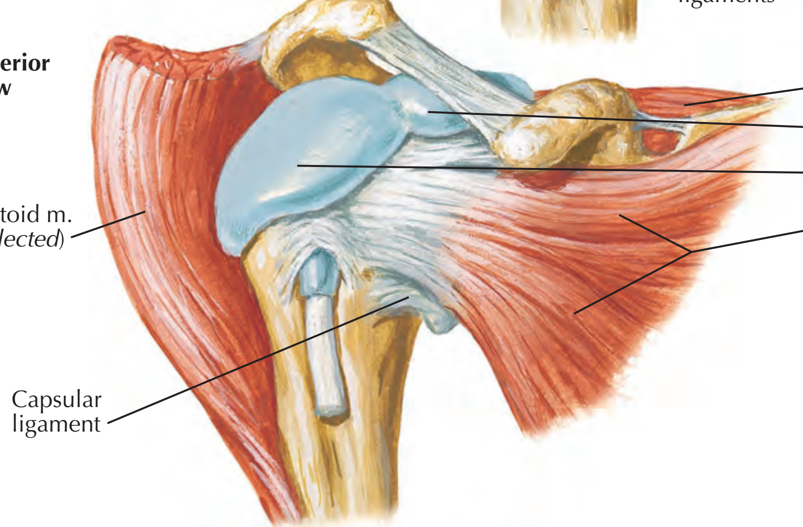

Acromion
Head of humerus
Lesser tubercle
Greater tubercle
Glenoid fossa
Coracoid process
Clavicle
Body of humerus
Neck of scapula

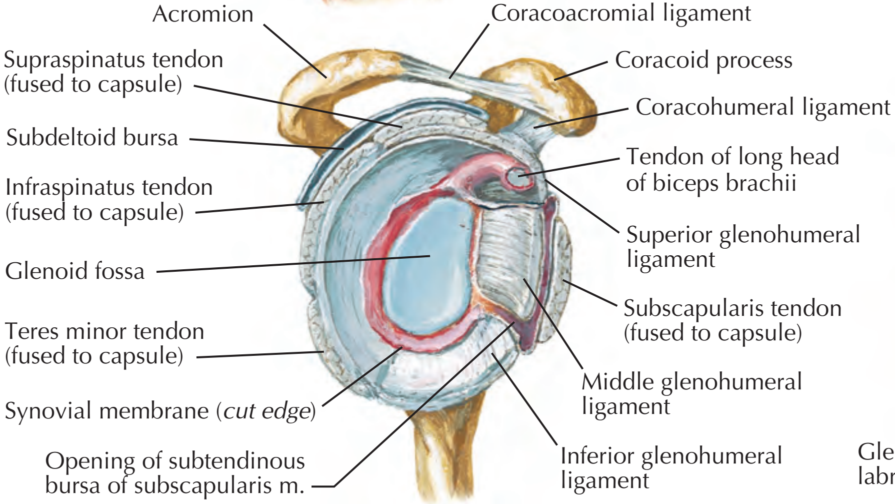
See also **Plates 434, 440, 441**

Anterior view

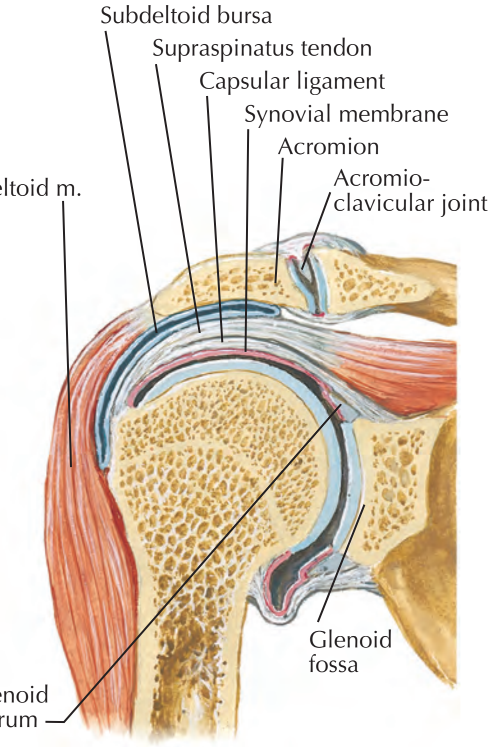

Acromioclavicular joint
Acromion
Coracoacromial ligament
Supraspinatus tendon (*cut*)
Coracohumeral ligament
Greater tubercle
Transverse humeral ligament
Intertubercular tendon sheath
Subscapularis tendon (*cut*)
Tendon of long head of biceps brachii
Capsular ligaments
Clavicle
Trapezoid ligament
Conoid ligament
Coraco-clavicular ligament
Superior transverse scapular ligament
Scapular notch
Coracoid process
Opening of subtendinous bursa of subscapularis m.
Dashed circle indicates position of subtendinous bursa of subscapularis m.

Anterior view


Deltoid m. (*reflected*)
Capsular ligament
Supraspinatus m.
Subacromial bursa
Subdeltoid bursa
Subscapularis m.


Acromion
Supraspinatus tendon (fused to capsule)
Subdeltoid bursa
Infraspinatus tendon (fused to capsule)
Glenoid fossa
Teres minor tendon (fused to capsule)
Synovial membrane (*cut edge*)
Opening of subtendinous bursa of subscapularis m.
Coracoacromial ligament
Coracoid process
Coracohumeral ligament
Tendon of long head of biceps brachii
Superior glenohumeral ligament
Subscapularis tendon (fused to capsule)
Middle glenohumeral ligament
Inferior glenohumeral ligament

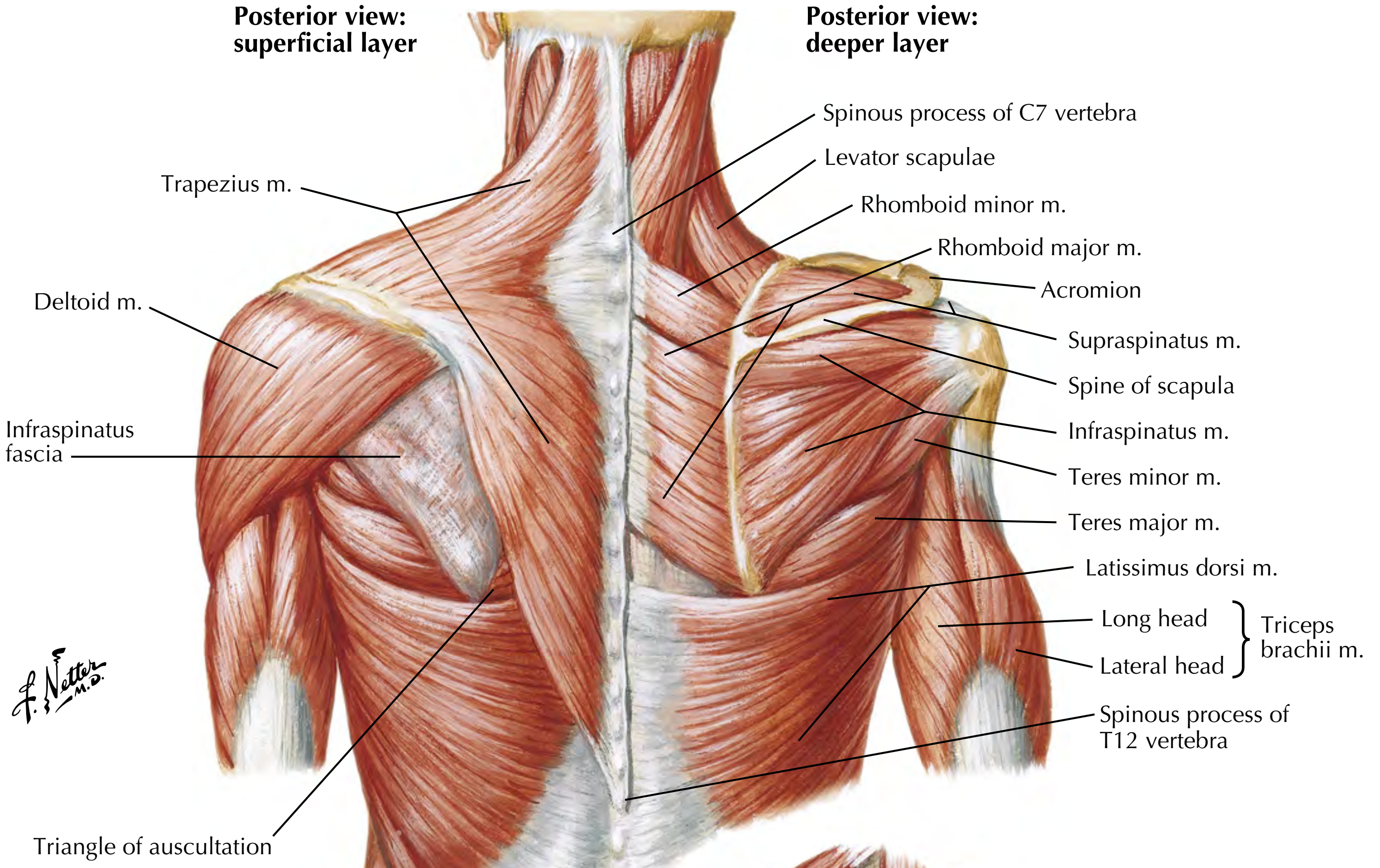
Joint opened: lateral view

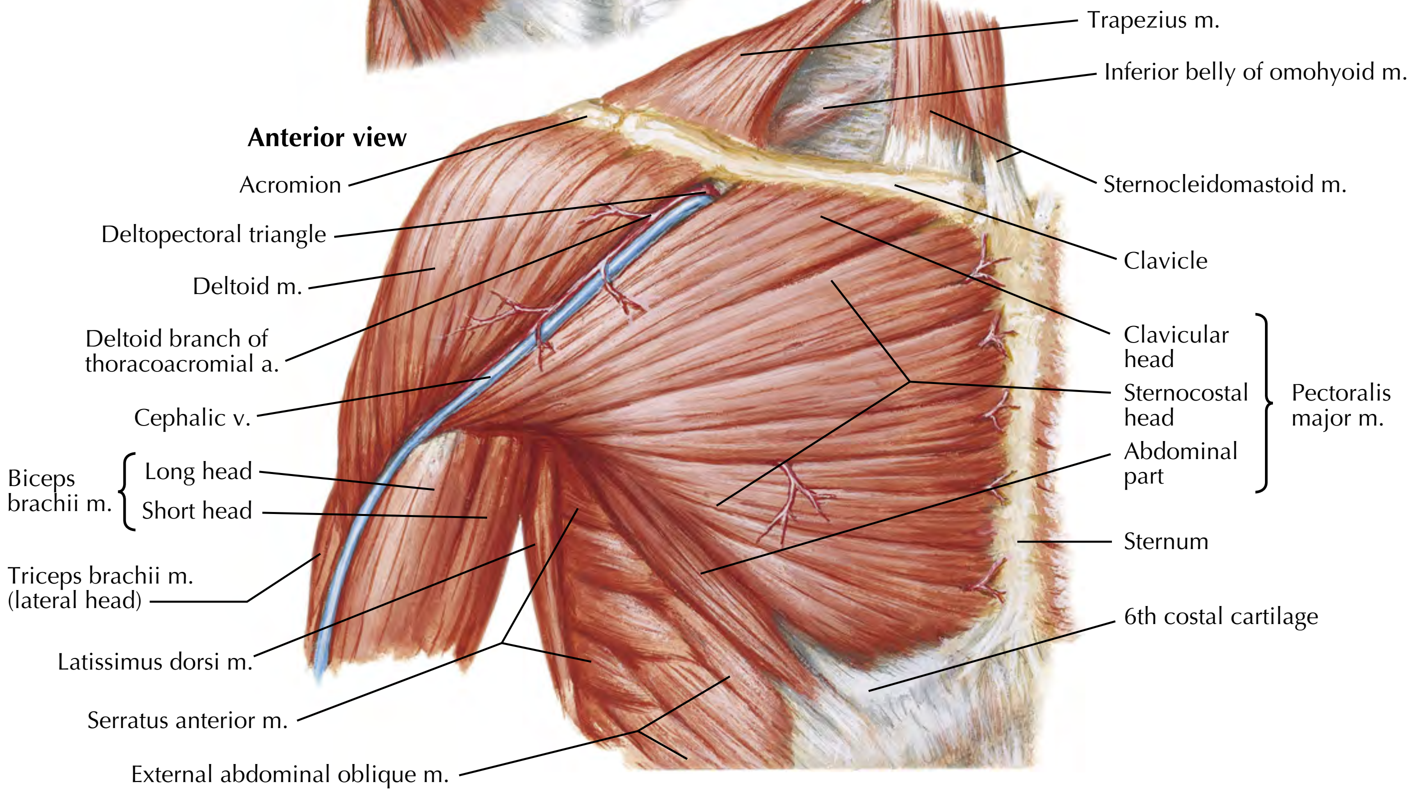

Subdeltoid bursa
Supraspinatus tendon
Capsular ligament
Synovial membrane
Acromion
Acromio-clavicular joint
Deltoid m.
Glenoid fossa
Glenoid labrum

Coronal section through shoulder girdle

Muscles of Shoulder

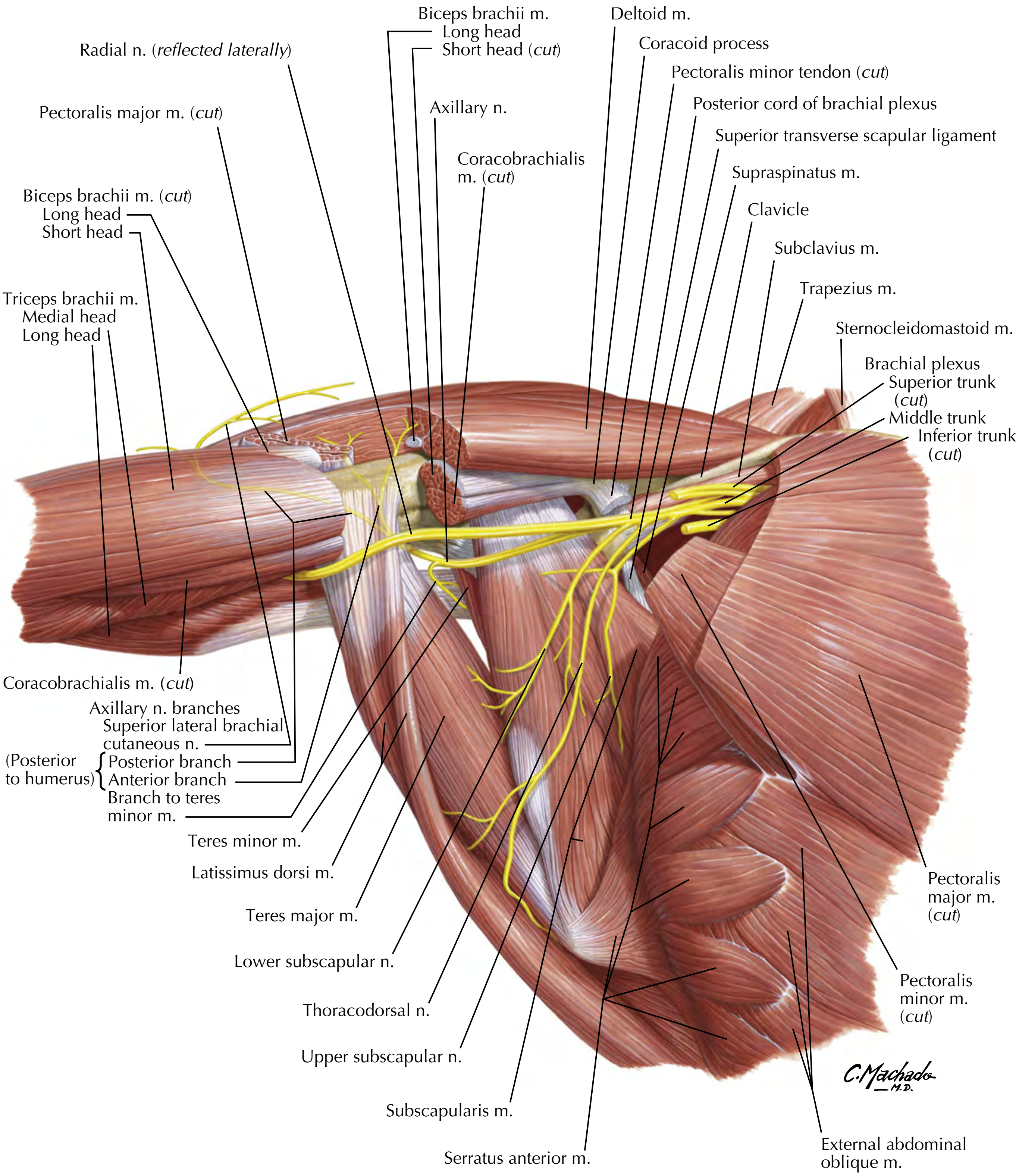
See also **Plates 195, 209**


Posterior view: superficial layer
Posterior view: deeper layer
Trapezius m.
Deltoid m.
Infraspinatus fascia
Triangle of auscultation
Spinous process of C7 vertebra
Levator scapulae
Rhomboid minor m.
Rhomboid major m.
Acromion
Supraspinatus m.
Spine of scapula
Infraspinatus m.
Teres minor m.
Teres major m.
Latissimus dorsi m.
Long head
Lateral head
Triceps brachii m.
Spinous process of T12 vertebra
F. Netter M.D.


Anterior view
Acromion
Deltopectoral triangle
Deltoid m.
Deltoid branch of thoracoacromial a.
Cephalic v.
Biceps brachii m.
Long head
Short head
Triceps brachii m. (lateral head)
Latissimus dorsi m.
Serratus anterior m.
External abdominal oblique m.
Trapezius m.
Inferior belly of omohyoid m.
Sternocleidomastoid m.
Clavicle
Clavicular head
Sternocostal head
Abdominal part
Pectoralis major m.
Sternum
6th costal cartilage

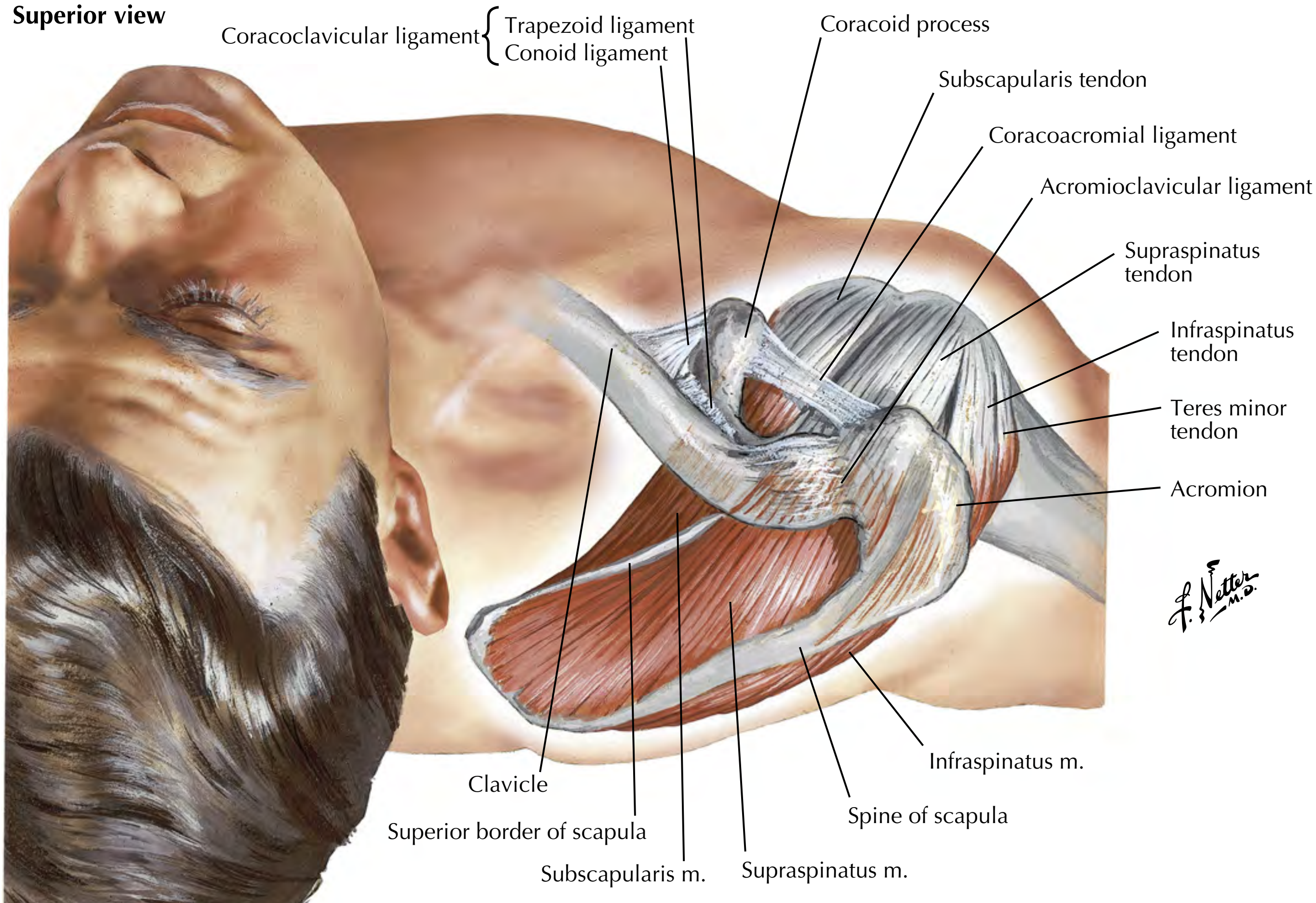
Axilla: Posterior Wall

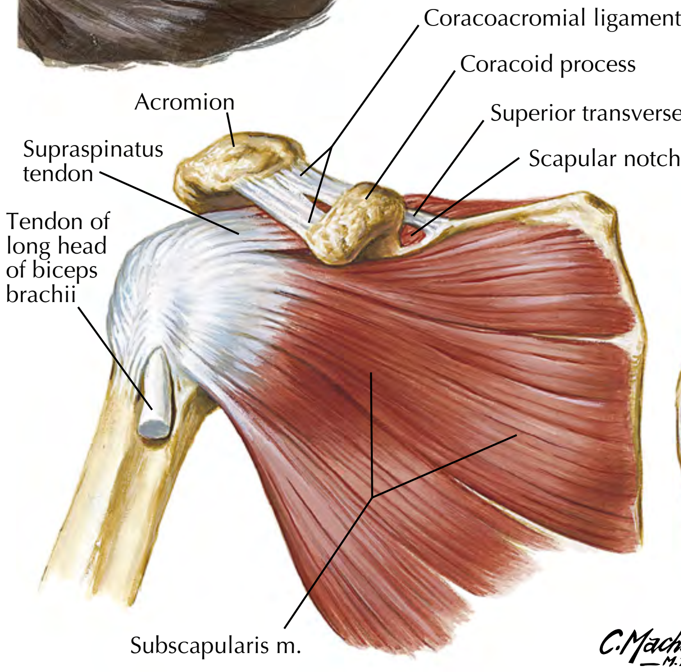
See also **Plates 438, 439**


Biceps brachii m.
Long head
Short head (*cut*)
Deltoid m.
Coracoid process
Radial n. (*reflected laterally*)
Pectoralis minor tendon (*cut*)
Posterior cord of brachial plexus
Pectoralis major m. (*cut*)
Axillary n.
Superior transverse scapular ligament
Coracobrachialis m. (*cut*)
Supraspinatus m.
Biceps brachii m. (*cut*)
Long head
Short head
Clavicle
Subclavius m.
Triceps brachii m.
Medial head
Long head
Trapezius m.
Sternocleidomastoid m.
Brachial plexus
Superior trunk (*cut*)
Middle trunk
Inferior trunk (*cut*)
Coracobrachialis m. (*cut*)
Axillary n. branches
Superior lateral brachial cutaneous n.
(Posterior to humerus)
Posterior branch
Anterior branch
Branch to teres minor m.
Teres minor m.
Latissimus dorsi m.
Teres major m.
Lower subscapular n.
Thoracodorsal n.
Upper subscapular n.
Subscapularis m.
Serratus anterior m.
Pectoralis major m. (*cut*)
Pectoralis minor m. (*cut*)
External abdominal oblique m.
C. Machado M.D.

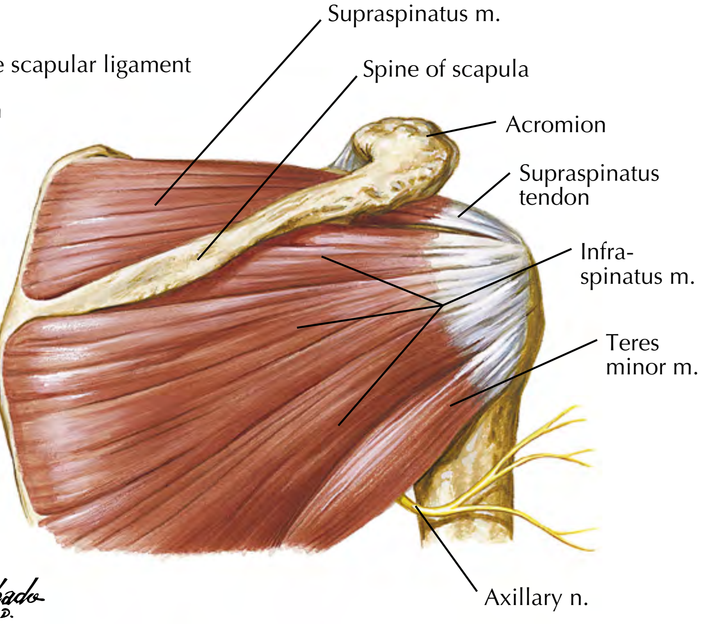
See also **Plates 431, 440, 441**

Superior view


Coracoclavicular ligament
Trapezoid ligament
Conoid ligament
Coracoid process
Subscapularis tendon
Coracoacromial ligament
Acromioclavicular ligament
Supraspinatus tendon
Infraspinatus tendon
Teres minor tendon
Acromion
Infraspinatus m.
Clavicle
Spine of scapula
Superior border of scapula
Subscapularis m.
Supraspinatus m.
F. Netter M.D.


Coracoacromial ligament
Coracoid process
Acromion
Superior transverse scapular ligament
Supraspinatus tendon
Scapular notch
Tendon of long head of biceps brachii
Subscapularis m.
C. Machado M.D.

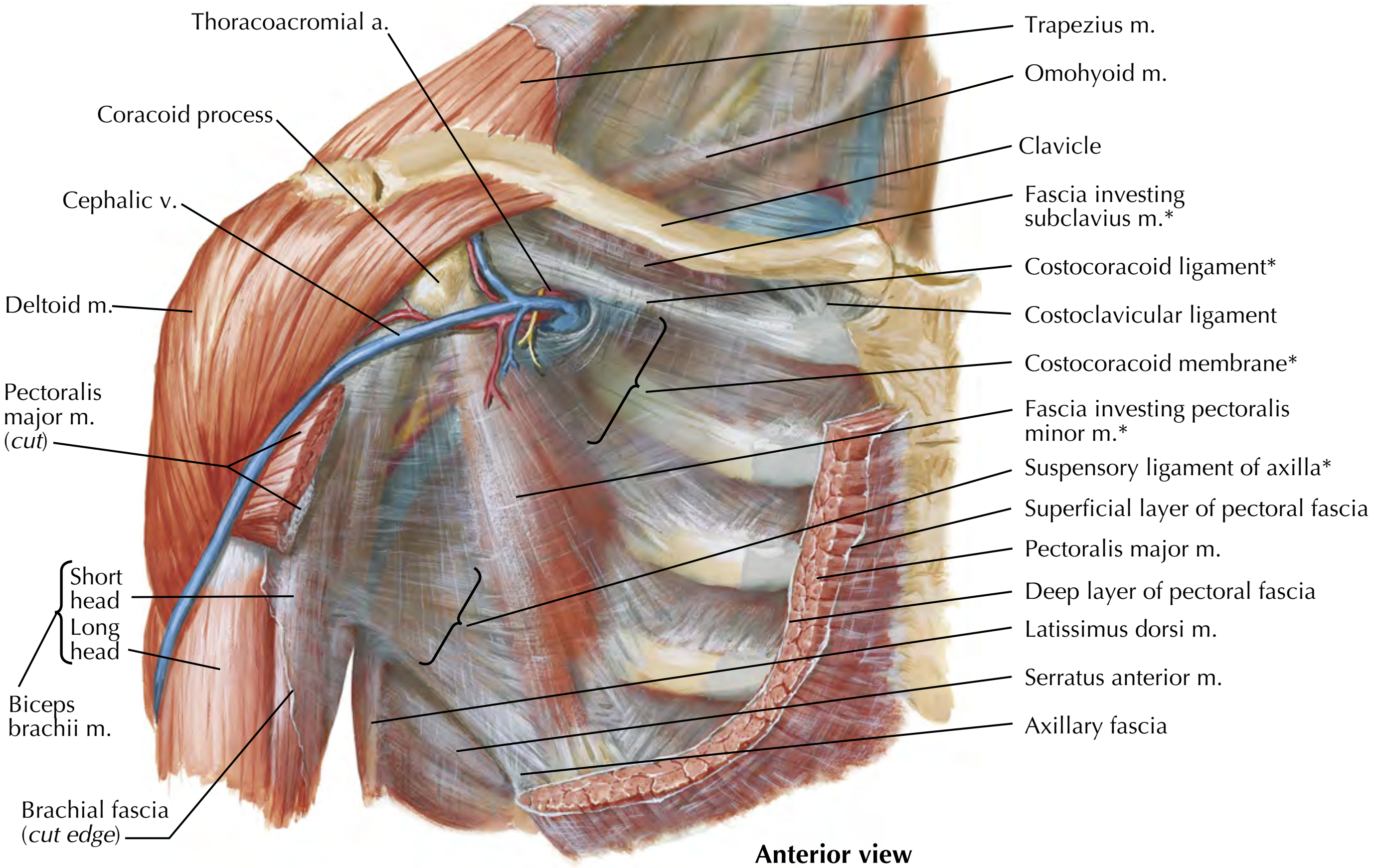
Anterior view


Supraspinatus m.
Spine of scapula
Acromion
Supraspinatus tendon
Infra-spinatus m.
Teres minor m.
Axillary n.

Posterior view

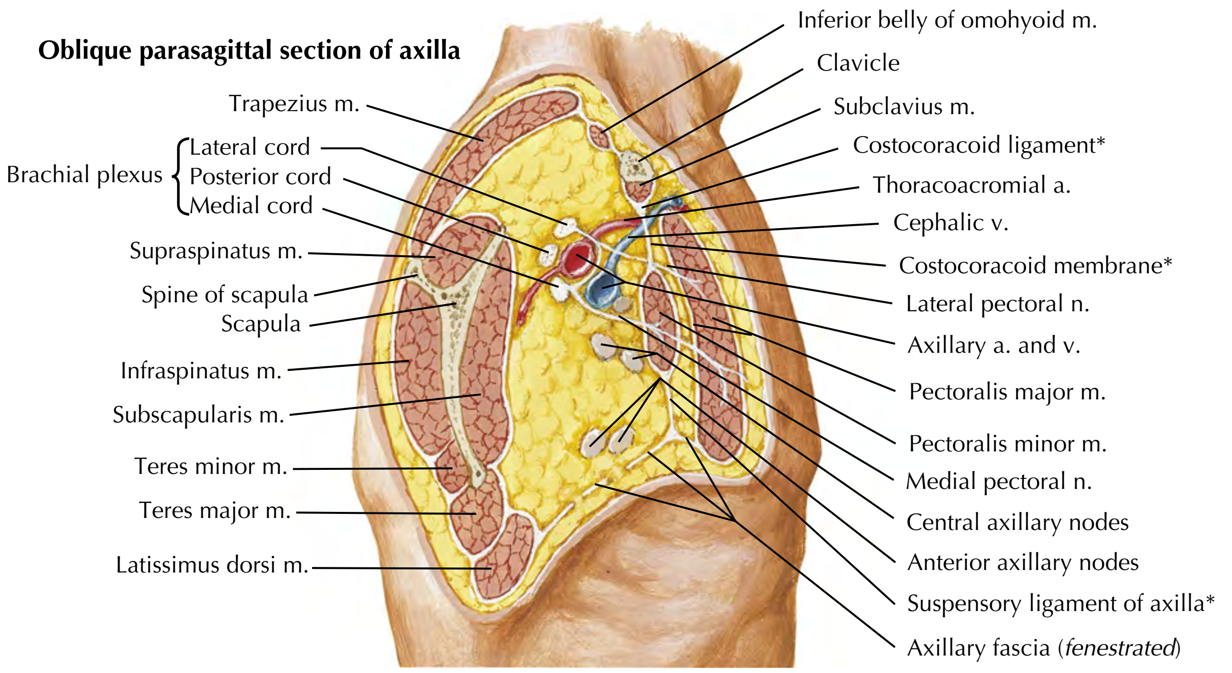
Pectoral, Clavipectoral, and Axillary Fasciae

See also **Plates 207, 209**


Thoracoacromial a.
Coracoid process
Cephalic v.
Deltoid m.
Pectoralis major m. (*cut*)
Short head
Long head
Biceps brachii m.
Brachial fascia (*cut edge*)
Trapezius m.
Omohyoid m.
Clavicle
Fascia investing subclavius m.*
Costocoracoid ligament*
Costoclavicular ligament
Costocoracoid membrane*
Fascia investing pectoralis minor m.*
Suspensory ligament of axilla*
Superficial layer of pectoral fascia
Pectoralis major m.
Deep layer of pectoral fascia
Latissimus dorsi m.
Serratus anterior m.
Axillary fascia

Anterior view

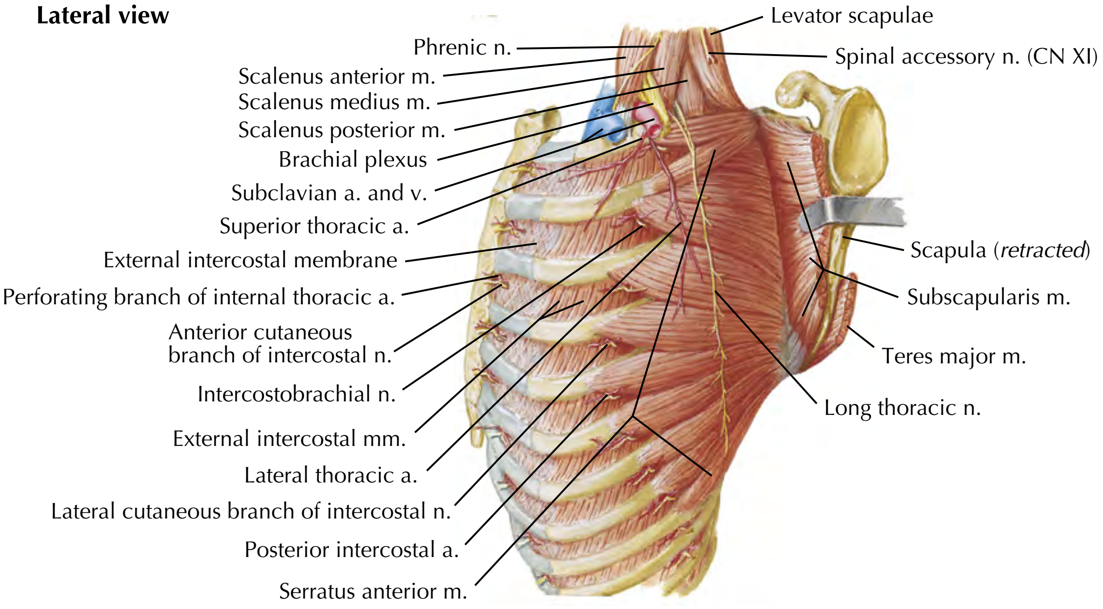
Oblique parasagittal section of axilla


Trapezius m.
Brachial plexus
Lateral cord
Posterior cord
Medial cord
Supraspinatus m.
Spine of scapula
Scapula
Infraspinatus m.
Subscapularis m.
Teres minor m.
Teres major m.
Latissimus dorsi m.
Inferior belly of omohyoid m.
Clavicle
Subclavius m.
Costocoracoid ligament*
Thoracoacromial a.
Cephalic v.
Costocoracoid membrane*
Lateral pectoral n.
Axillary a. and v.
Pectoralis major m.
Pectoralis minor m.
Medial pectoral n.
Central axillary nodes
Anterior axillary nodes
Suspensory ligament of axilla*
Axillary fascia (*fenestrated*)

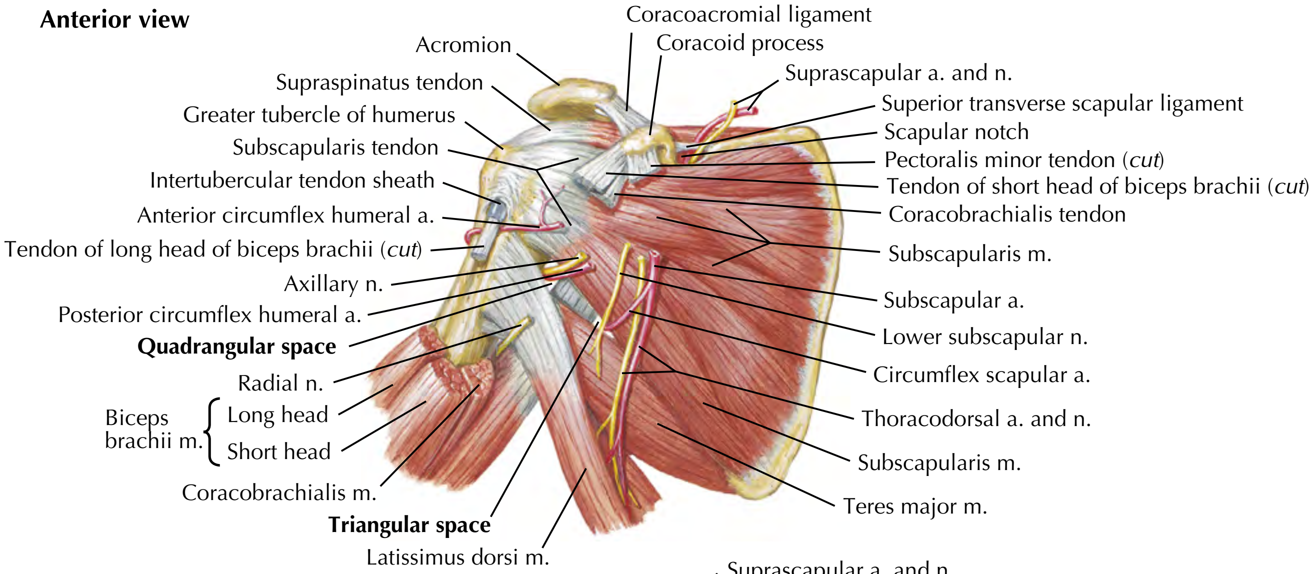
*Components of clavipectoral fascia

See also **Plates 438, 488**

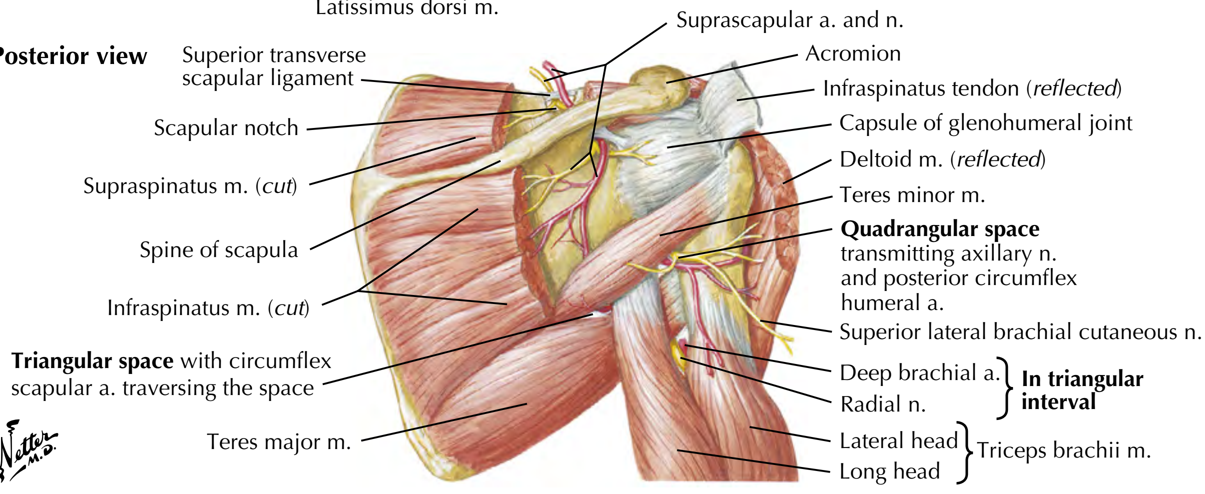
Lateral view


Levator scapulae
Phrenic n.
Spinal accessory n. (CN XI)
Scalenus anterior m.
Scalenus medius m.
Scalenus posterior m.
Brachial plexus
Subclavian a. and v.
Superior thoracic a.
Scapula (*retracted*)
External intercostal membrane
Perforating branch of internal thoracic a.
Subscapularis m.
Anterior cutaneous branch of intercostal n.
Teres major m.
Intercostobrachial n.
Long thoracic n.
External intercostal mm.
Lateral thoracic a.
Lateral cutaneous branch of intercostal n.
Posterior intercostal a.
Serratus anterior m.

Anterior view


Coracoacromial ligament
Acromion
Coracoid process
Supraspinatus tendon
Suprascapular a. and n.
Greater tubercle of humerus
Superior transverse scapular ligament
Scapular notch
Subscapularis tendon
Pectoralis minor tendon (*cut*)
Intertubercular tendon sheath
Tendon of short head of biceps brachii (*cut*)
Anterior circumflex humeral a.
Coracobrachialis tendon
Tendon of long head of biceps brachii (*cut*)
Subscapularis m.
Axillary n.
Subscapular a.
Posterior circumflex humeral a.
Lower subscapular n.
Quadrangular space
Circumflex scapular a.
Radial n.
Biceps brachii m.
Long head
Short head
Thoracodorsal a. and n.
Subscapularis m.
Coracobrachialis m.
Teres major m.
Triangular space
Latissimus dorsi m.

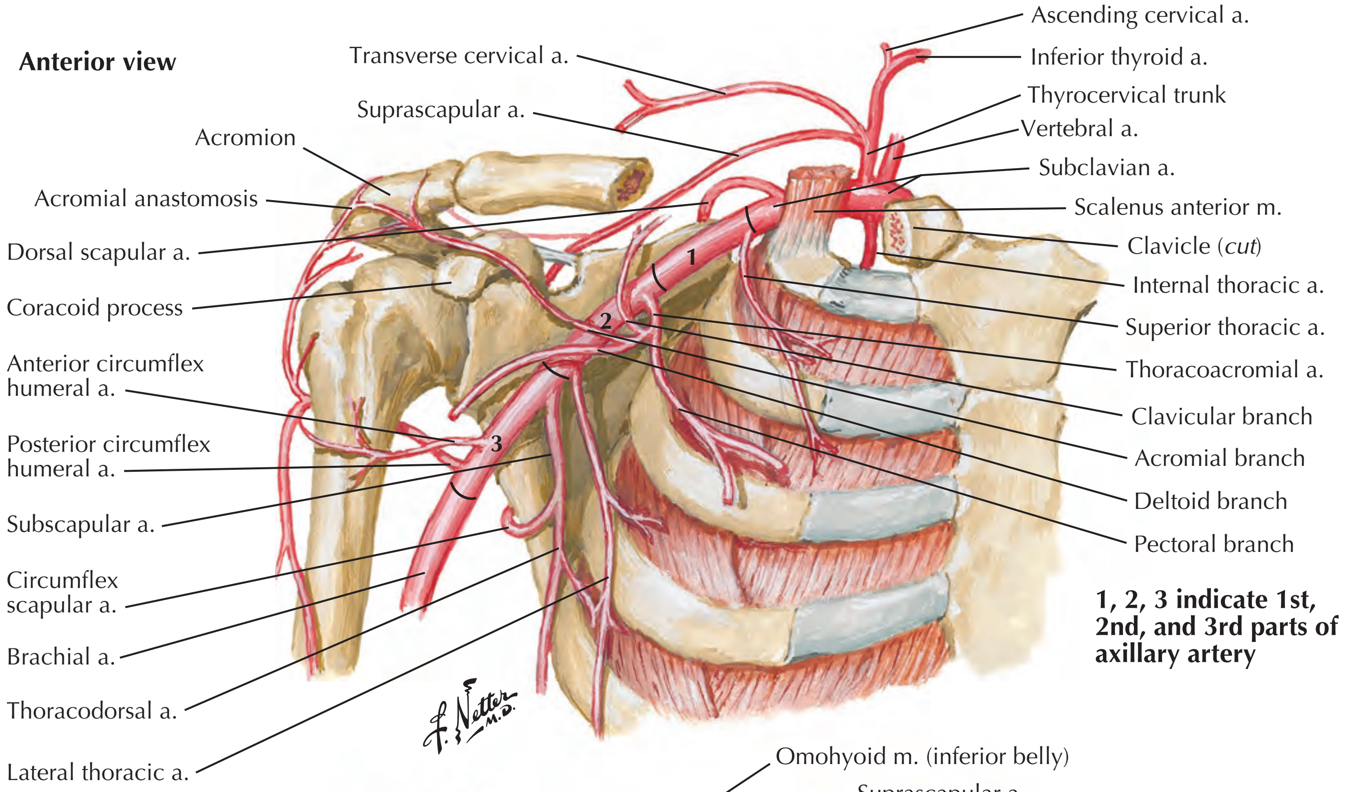
Posterior view


Suprascapular a. and n.
Acromion
Superior transverse scapular ligament
Infraspinatus tendon (*reflected*)
Capsule of glenohumeral joint
Scapular notch
Deltoid m. (*reflected*)
Supraspinatus m. (*cut*)
Teres minor m.
Quadrangular space transmitting axillary n. and posterior circumflex humeral a.
Spine of scapula
Infraspinatus m. (*cut*)
Superior lateral brachial cutaneous n.
Triangular space with circumflex scapular a. traversing the space
Deep brachial a.
Radial n.
In triangular interval
Teres major m.
Lateral head
Long head
Triceps brachii m.
F. Netter M.D.

Axillary Artery and Anastomoses Around Scapula

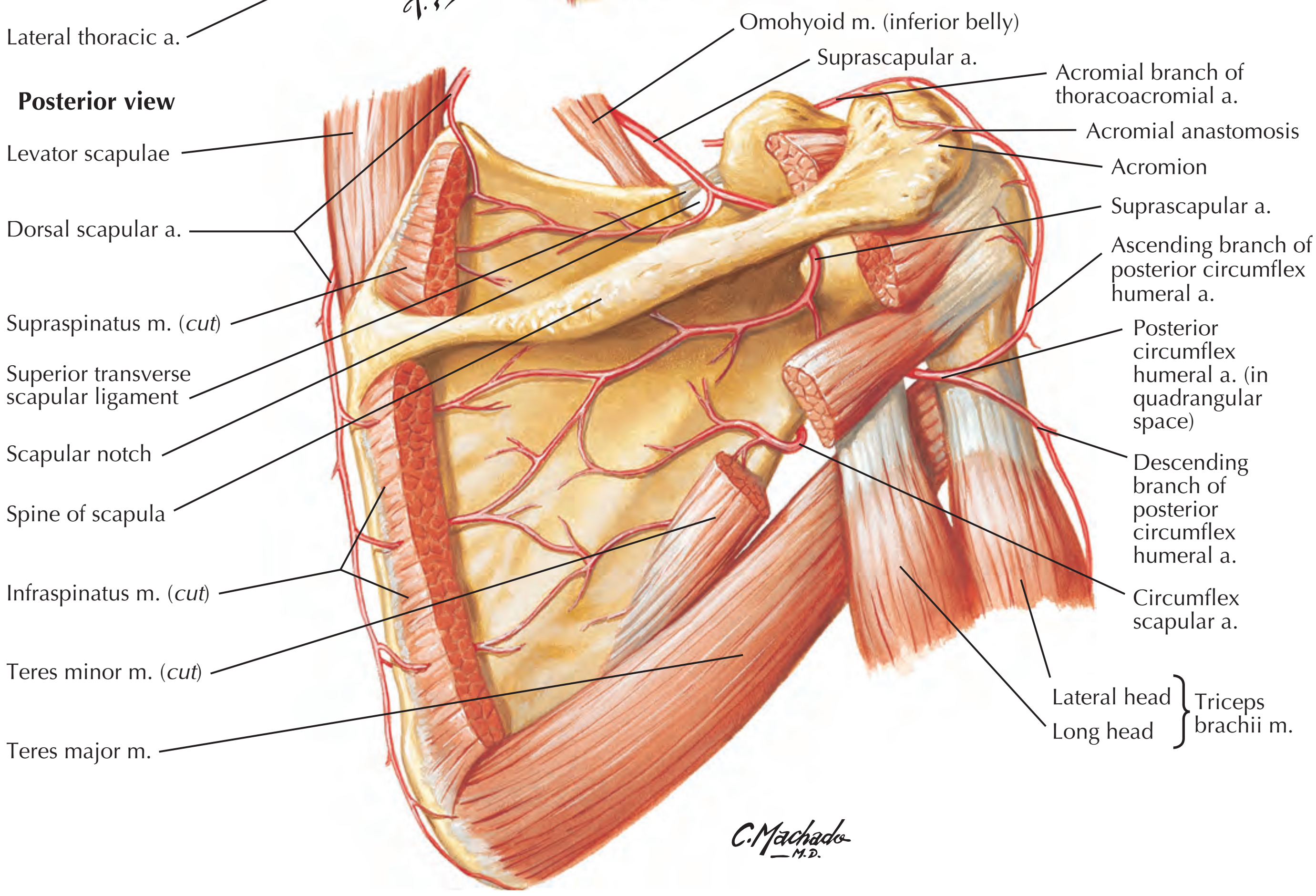
See also **Plates 57, 443, BP 24**

Anterior view


Transverse cervical a.
Suprascapular a.
Acromion
Acromial anastomosis
Dorsal scapular a.
Coracoid process
Anterior circumflex humeral a.
Posterior circumflex humeral a.
Subscapular a.
Circumflex scapular a.
Brachial a.
Thoracodorsal a.
Lateral thoracic a.
Ascending cervical a.
Inferior thyroid a.
Thyrocervical trunk
Vertebral a.
Subclavian a.
Scalenus anterior m.
Clavicle (*cut*)
Internal thoracic a.
Superior thoracic a.
Thoracoacromial a.
Clavicular branch
Acromial branch
Deltoid branch
Pectoral branch
1
2
3
F. Netter M.D.

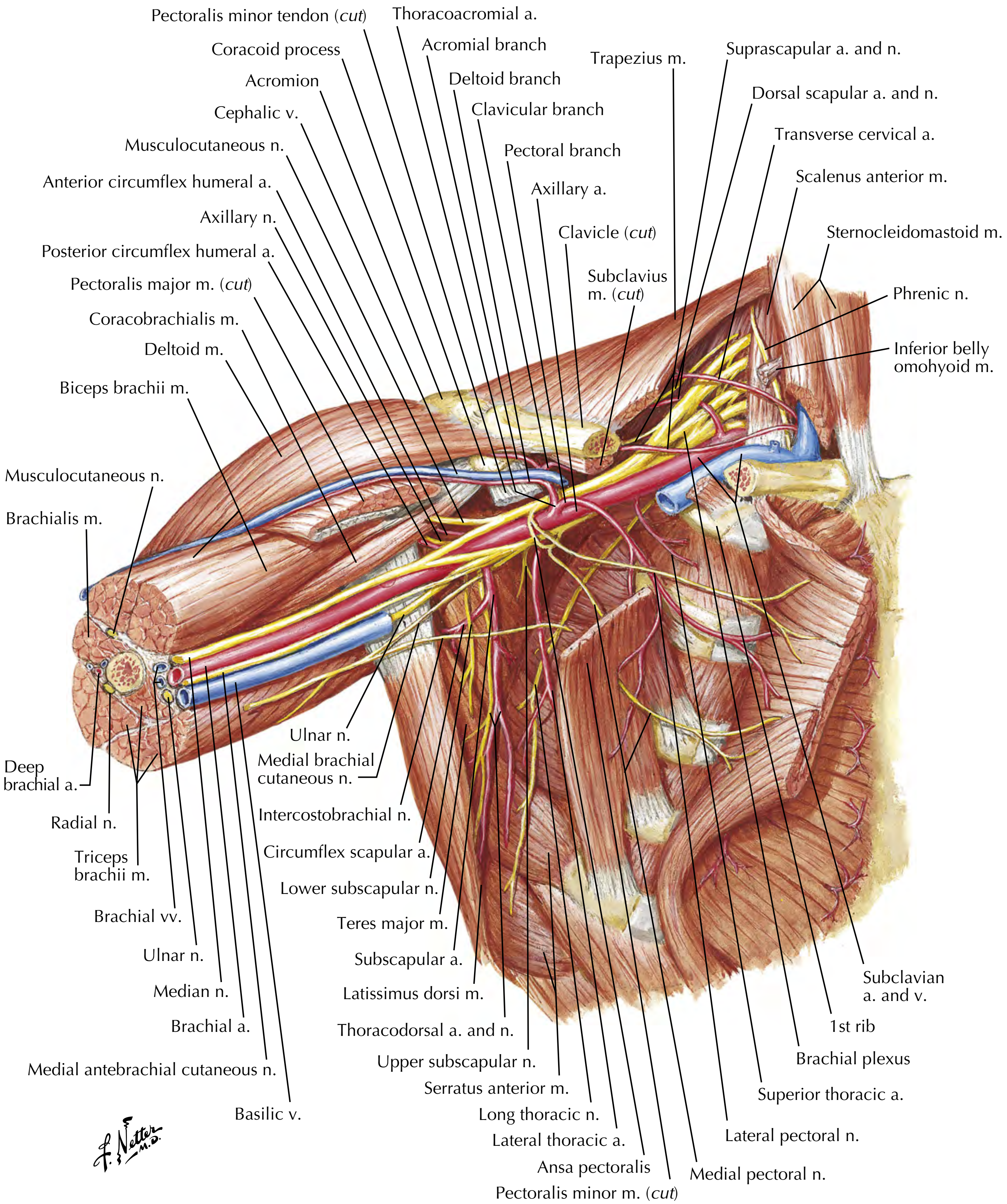
1, 2, 3 indicate 1st, 2nd, and 3rd parts of axillary artery

Posterior view


Omohyoid m. (inferior belly)
Suprascapular a.
Acromial branch of thoracoacromial a.
Acromial anastomosis
Acromion
Suprascapular a.
Ascending branch of posterior circumflex humeral a.
Posterior circumflex humeral a. (in quadrangular space)
Descending branch of posterior circumflex humeral a.
Circumflex scapular a.
Lateral head
Long head
Triceps brachii m.
Levator scapulae
Dorsal scapular a.
Supraspinatus m. (*cut*)
Superior transverse scapular ligament
Scapular notch
Spine of scapula
Infraspinatus m. (*cut*)
Teres minor m. (*cut*)
Teres major m.
C. Machado M.D.

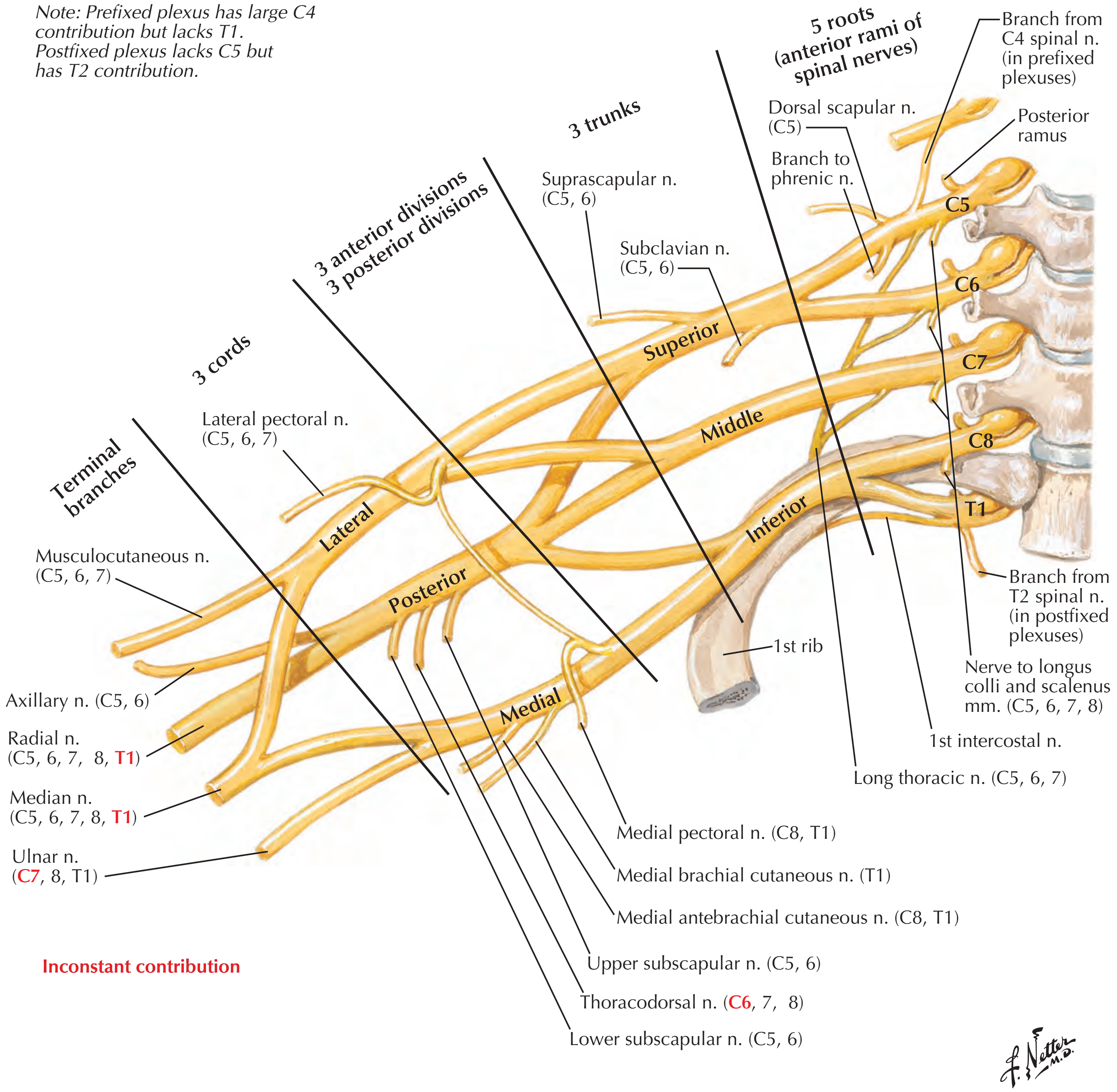
Axilla: Anterior View

See also **Plates 433, 436, BP 41**

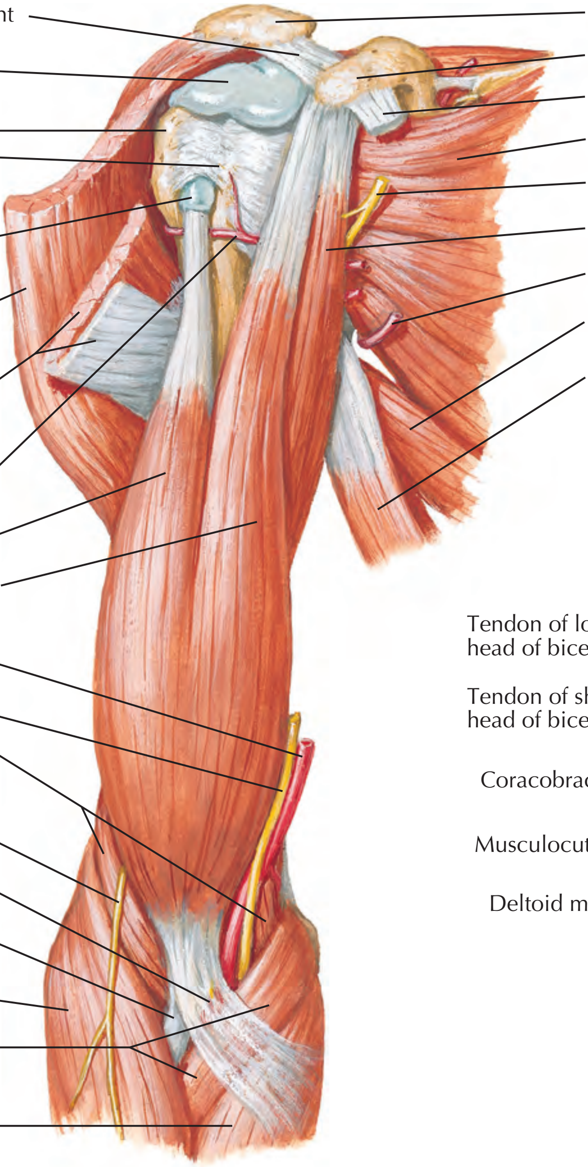

Pectoralis minor tendon (*cut*)
Thoracoacromial a.
Acromial branch
Deltoid branch
Clavicular branch
Pectoral branch
Axillary a.
Clavicle (*cut*)
Subclavius m. (*cut*)
Trapezius m.
Suprascapular a. and n.
Dorsal scapular a. and n.
Transverse cervical a.
Scalenus anterior m.
Sternocleidomastoid m.
Phrenic n.
Inferior belly omohyoid m.
Coracoid process
Acromion
Cephalic v.
Musculocutaneous n.
Anterior circumflex humeral a.
Axillary n.
Posterior circumflex humeral a.
Pectoralis major m. (*cut*)
Coracobrachialis m.
Deltoid m.
Biceps brachii m.
Musculocutaneous n.
Brachialis m.
Deep brachial a.
Radial n.
Triceps brachii m.
Brachial vv.
Ulnar n.
Median n.
Brachial a.
Medial antebrachial cutaneous n.
Basilic v.
Ulnar n.
Medial brachial cutaneous n.
Intercostobrachial n.
Circumflex scapular a.
Lower subscapular n.
Teres major m.
Subscapular a.
Latissimus dorsi m.
Thoracodorsal a. and n.
Upper subscapular n.
Serratus anterior m.
Long thoracic n.
Lateral thoracic a.
Ansa pectoralis
Pectoralis minor m. (*cut*)
Medial pectoral n.
Lateral pectoral n.
Superior thoracic a.
Brachial plexus
1st rib
Subclavian a. and v.
F. Netter M.D.

See also **Plates 483, 484**

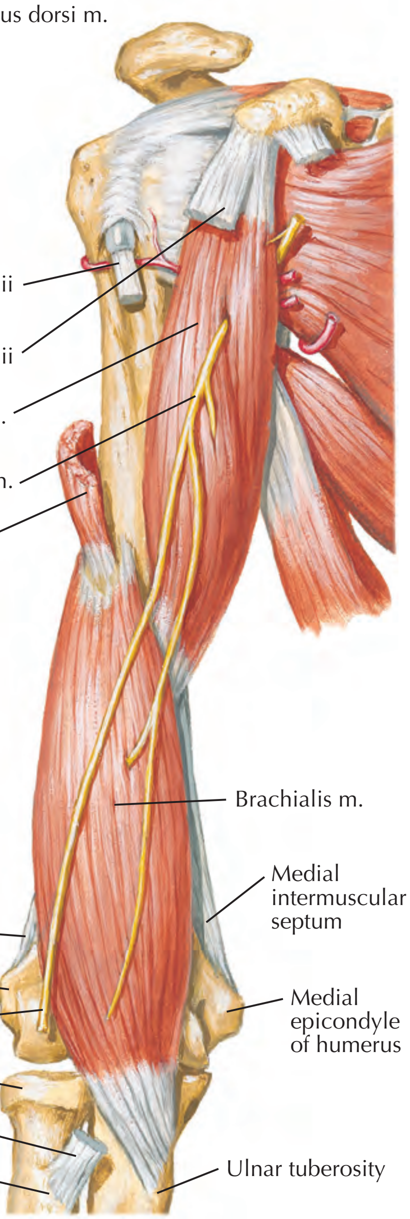
Note: Prefixed plexus has large C4 contribution but lacks T1. Postfixed plexus lacks C5 but has T2 contribution.


5 roots (anterior rami of spinal nerves)
Branch from C4 spinal n. (in prefixed plexuses)
Posterior ramus
Dorsal scapular n. (C5)
Branch to phrenic n.
3 trunks
Suprascapular n. (C5, 6)
Subclavian n. (C5, 6)
3 anterior divisions
3 posterior divisions
3 cords
Terminal branches
Lateral pectoral n. (C5, 6, 7)
Musculocutaneous n. (C5, 6, 7)
Axillary n. (C5, 6)
Radial n. (C5, 6, 7, 8, T1)
Median n. (C5, 6, 7, 8, T1)
Ulnar n. (C7, 8, T1)
C5
C6
C7
C8
T1
Superior
Middle
Inferior
Lateral
Posterior
Medial
Branch from T2 spinal n. (in postfixed plexuses)
Nerve to longus colli and scalenus mm. (C5, 6, 7, 8)
1st rib
1st intercostal n.
Long thoracic n. (C5, 6, 7)
Medial pectoral n. (C8, T1)
Medial brachial cutaneous n. (T1)
Medial antebrachial cutaneous n. (C8, T1)
Upper subscapular n. (C5, 6)
Thoracodorsal n. (C6, 7, 8)
Lower subscapular n. (C5, 6)
Inconstant contribution

See also **Plates 434, 485**


Coracoacromial ligament
Subacromial bursa
Greater tubercle
Lesser tubercle
of humerus
Intertubercular
tendon sheath
Deltoid m.
(*reflected*)
Pectoralis major m.
(*reflected*)
Anterior circumflex
humeral a.
Biceps
brachii m.
Long head
Short head
Brachial a. (*cut*)
Median n. (*cut*)
Brachialis m.
Lateral antebrachial
cutaneous n.
Bicipital aponeurosis
Biceps brachii tendon
Brachioradialis m.
Pronator teres
Flexor carpi
radialis
Acromion
Coracoid process
Pectoralis minor tendon (*cut*)
Subscapularis m.
Musculocutaneous n. (*cut*)
Coracobrachialis m.
Circumflex scapular a. (cut)
Teres major m.
Latissimus dorsi m.

Superficial layer

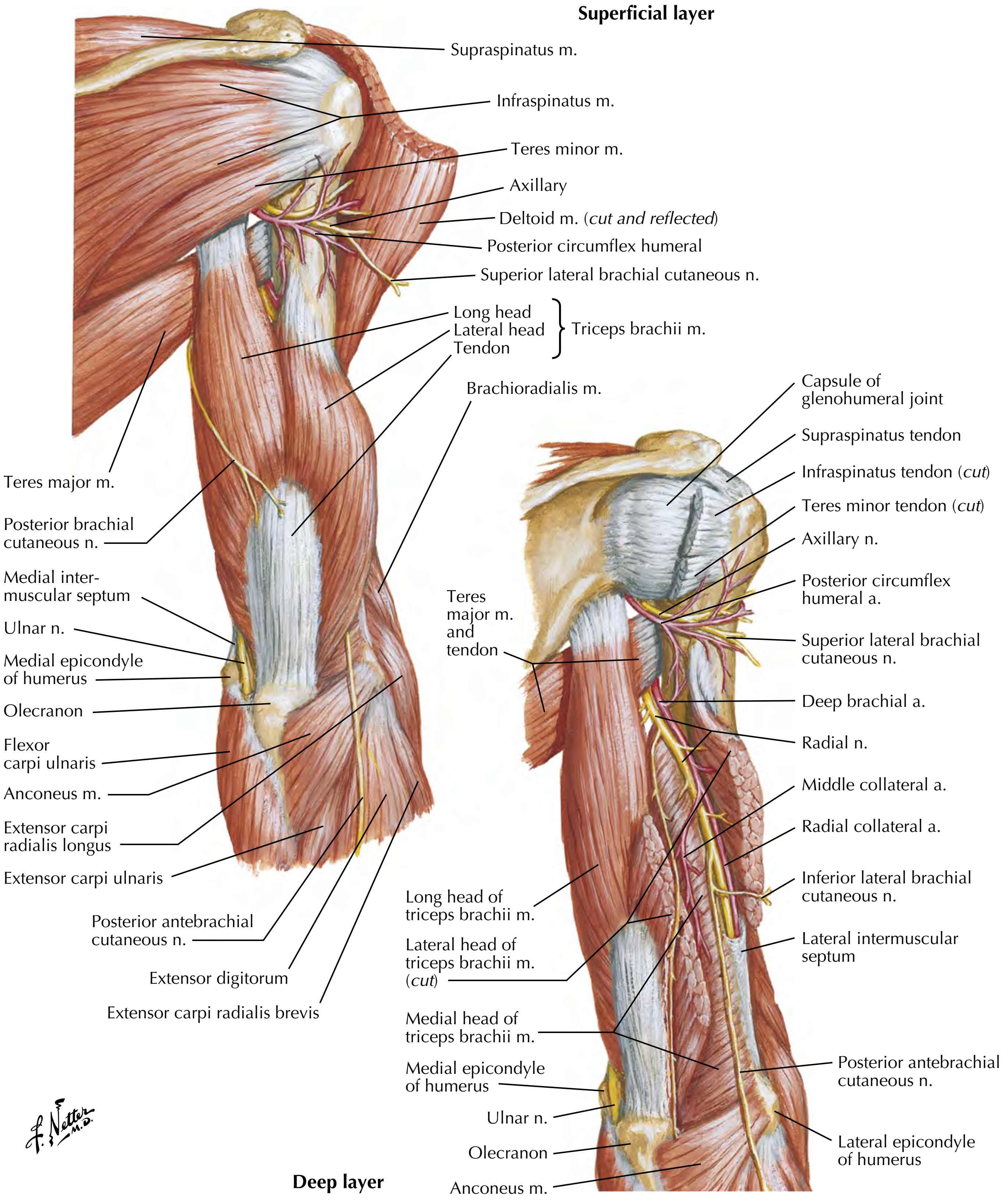

Tendon of long
head of biceps brachii
Tendon of short
head of biceps brachii
Coracobrachialis m.
Musculocutaneous n.
Deltoid m. (*cut*)
Brachialis m.
Medial
intermuscular
septum
Lateral intermuscular septum
Lateral epicondyle of humerus
Lateral antebrachial cutaneous n.
Medial
epicondyle
of humerus
Head of radius
Biceps brachii tendon
Radial tuberosity
Ulnar tuberosity

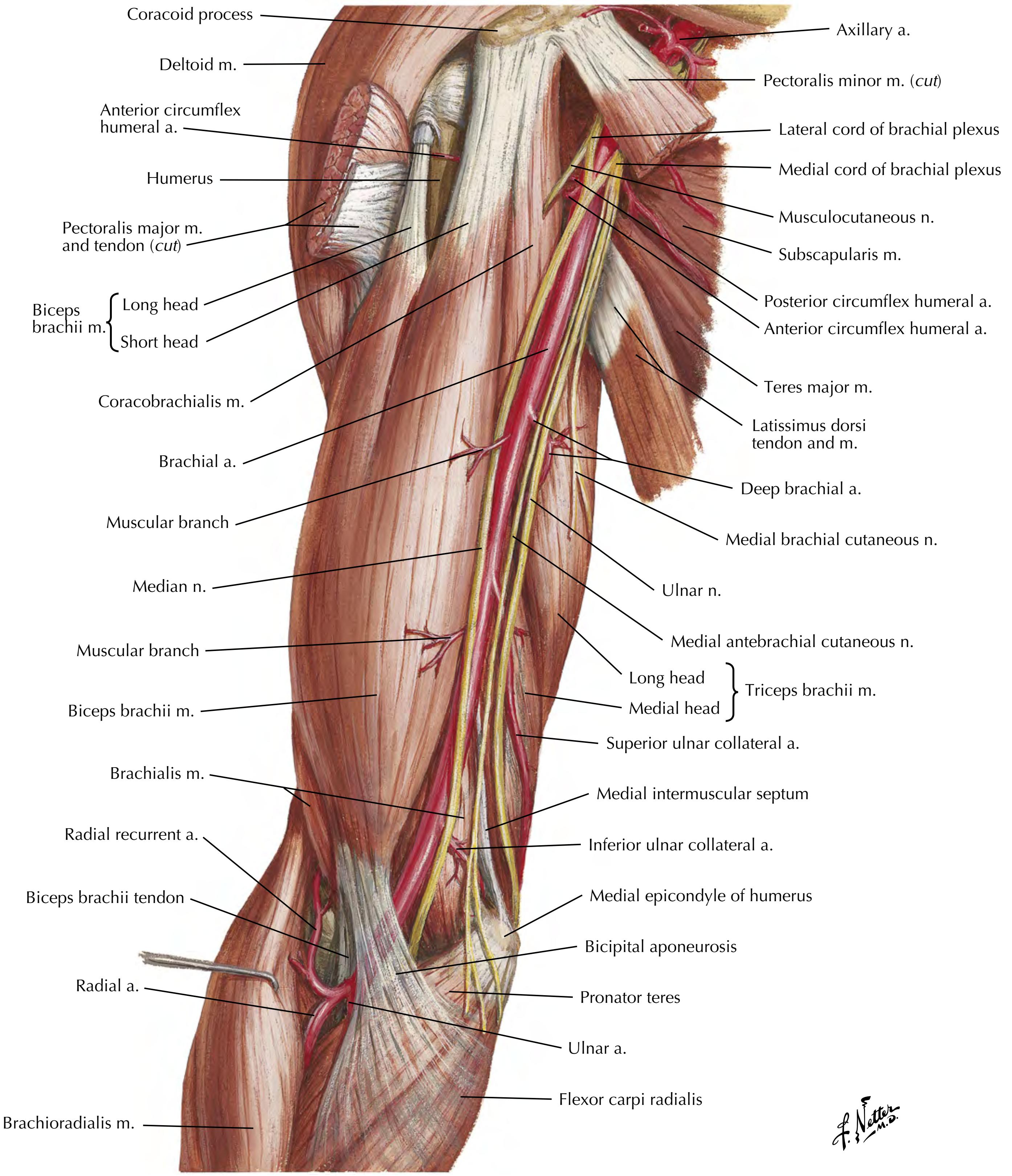
Deep layer

F. Netter M.D.

Muscles of Arm: Posterior Compartment

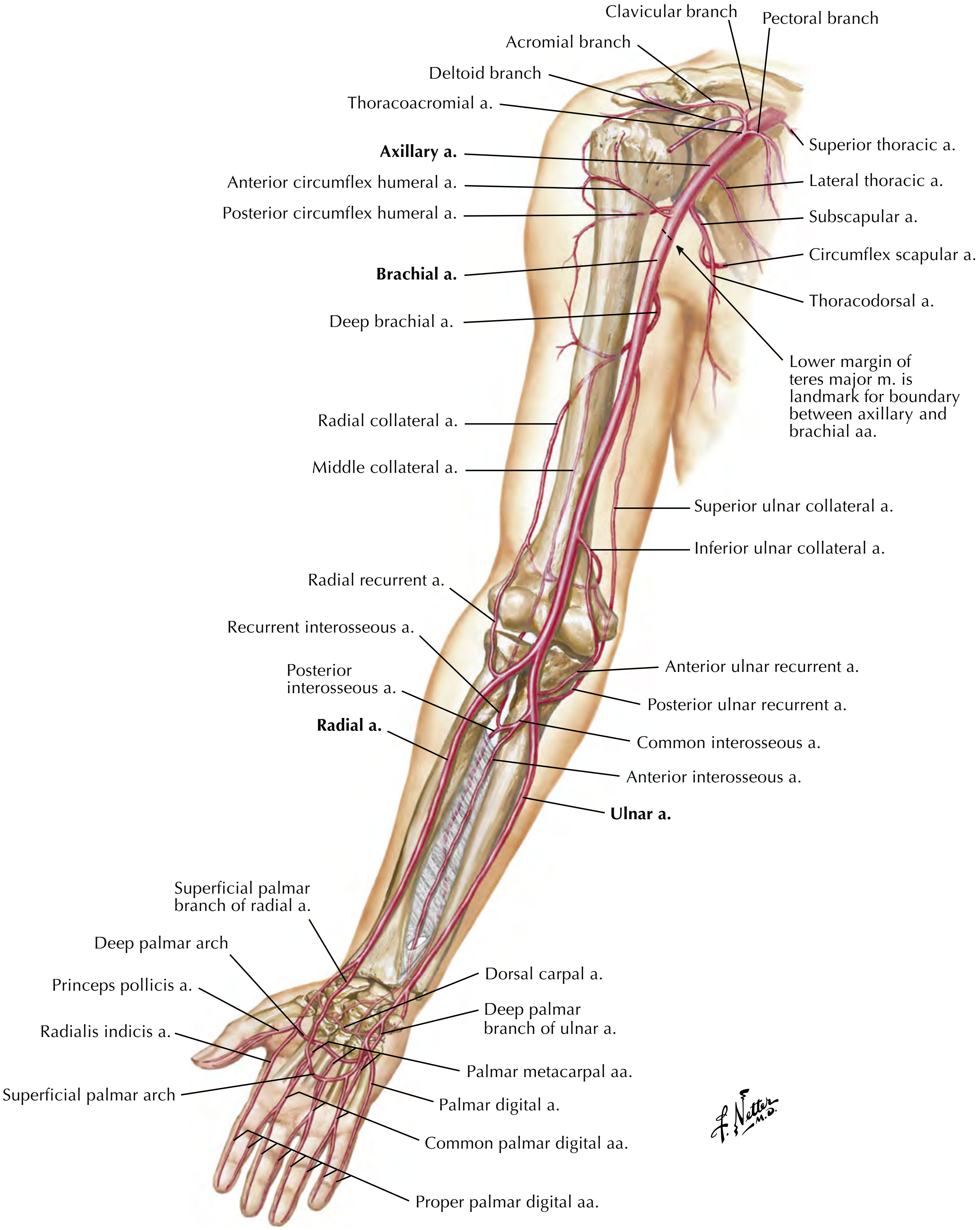
See also **Plates 434, 488**

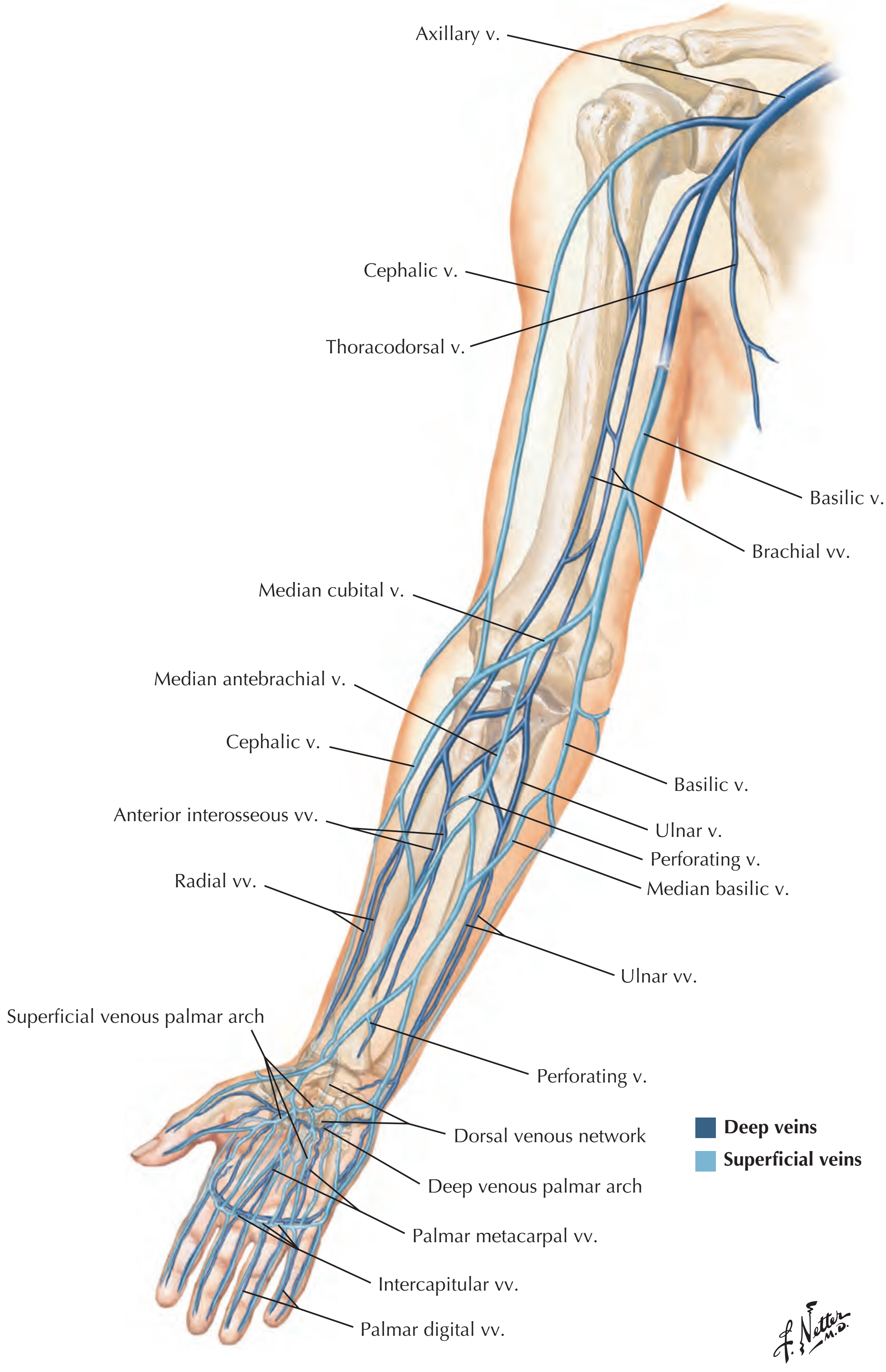

Superficial layer
Supraspinatus m.
Infraspinatus m.
Teres minor m.
Axillary
Deltoid m. (cut and reflected)
Posterior circumflex humeral
Superior lateral brachial cutaneous n.
Long head
Lateral head
Tendon
Triceps brachii m.
Brachioradialis m.
Teres major m.
Posterior brachial cutaneous n.
Medial inter-muscular septum
Ulnar n.
Medial epicondyle of humerus
Olecranon
Flexor carpi ulnaris
Anconeus m.
Extensor carpi radialis longus
Extensor carpi ulnaris
Posterior antebrachial cutaneous n.
Extensor digitorum
Extensor carpi radialis brevis
Capsule of glenohumeral joint
Supraspinatus tendon
Infraspinatus tendon (cut)
Teres minor tendon (cut)
Axillary n.
Posterior circumflex humeral a.
Superior lateral brachial cutaneous n.
Deep brachial a.
Radial n.
Middle collateral a.
Radial collateral a.
Inferior lateral brachial cutaneous n.
Lateral intermuscular septum
Teres major m. and tendon
Long head of triceps brachii m.
Lateral head of triceps brachii m. (cut)
Medial head of triceps brachii m.
Posterior antebrachial cutaneous n.
Medial epicondyle of humerus
Ulnar n.
Lateral epicondyle of humerus
Olecranon
Anconeus m.
Deep layer

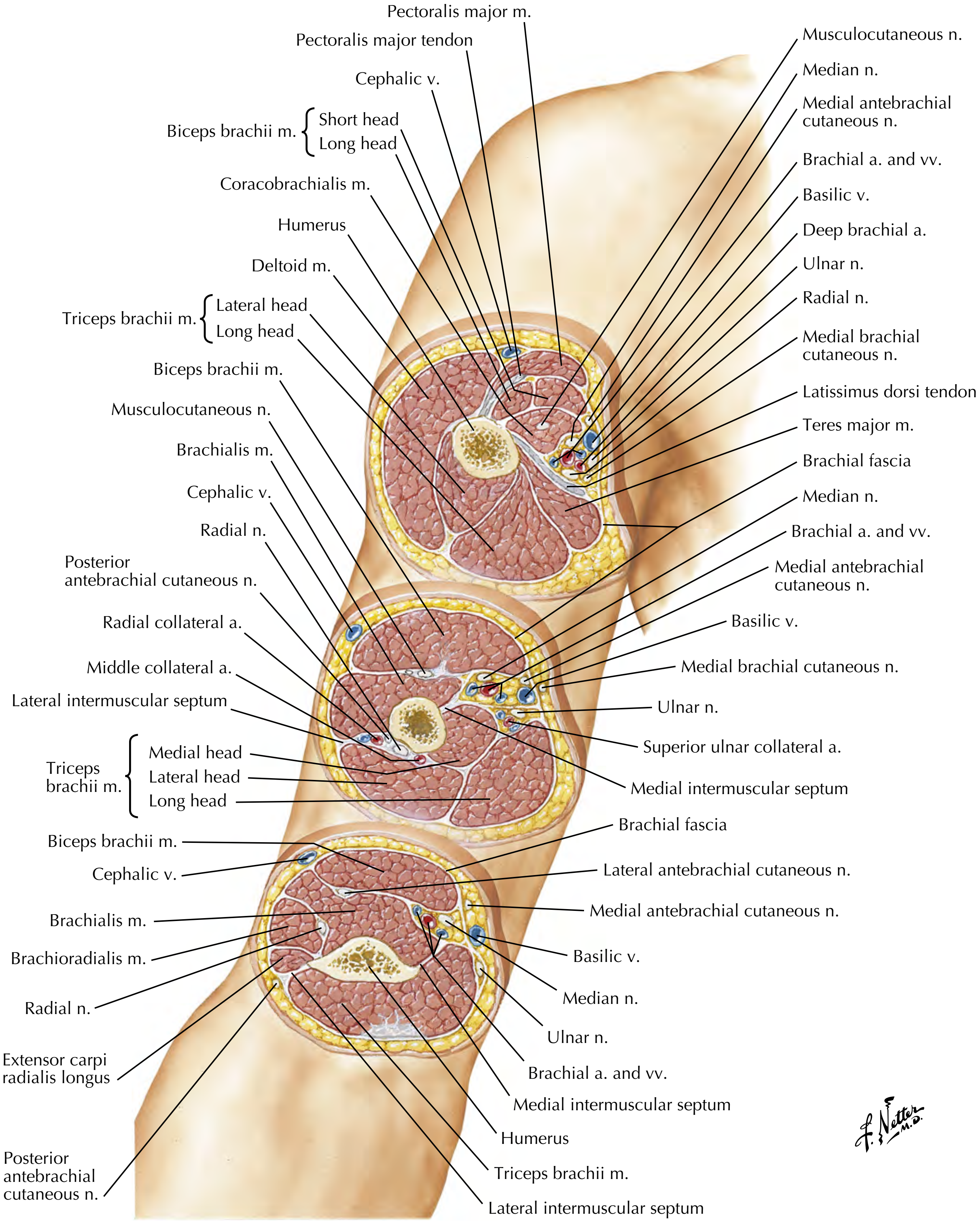

Coracoid process
Deltoid m.
Anterior circumflex humeral a.
Humerus
Pectoralis major m. and tendon (*cut*)
Biceps brachii m.
Long head
Short head
Coracobrachialis m.
Brachial a.
Muscular branch
Median n.
Muscular branch
Biceps brachii m.
Brachialis m.
Radial recurrent a.
Biceps brachii tendon
Radial a.
Brachioradialis m.
Axillary a.
Pectoralis minor m. (*cut*)
Lateral cord of brachial plexus
Medial cord of brachial plexus
Musculocutaneous n.
Subscapularis m.
Posterior circumflex humeral a.
Anterior circumflex humeral a.
Teres major m.
Latissimus dorsi tendon and m.
Deep brachial a.
Medial brachial cutaneous n.
Ulnar n.
Medial antebrachial cutaneous n.
Long head
Medial head
Triceps brachii m.
Superior ulnar collateral a.
Medial intermuscular septum
Inferior ulnar collateral a.
Medial epicondyle of humerus
Bicipital aponeurosis
Pronator teres
Ulnar a.
Flexor carpi radialis
F. Netter M.D.

Arteries of Upper Limb

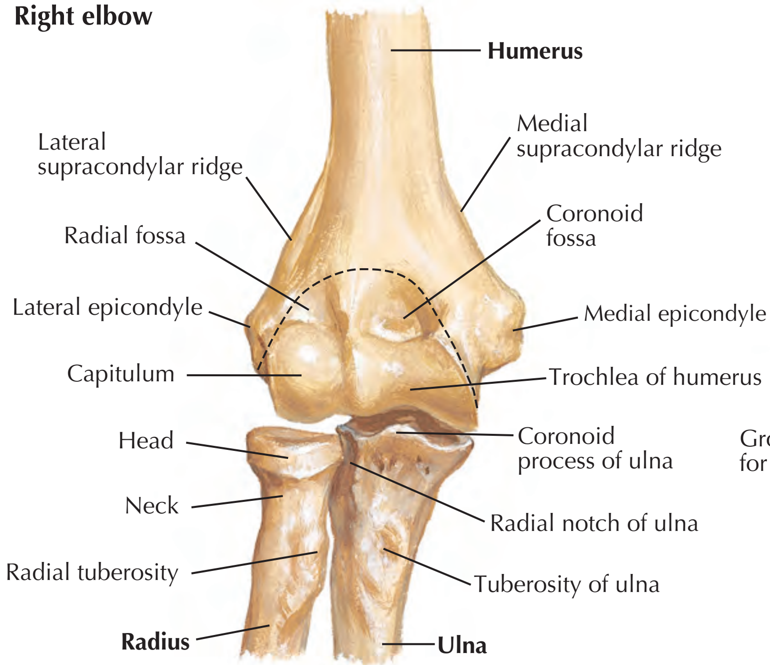
See also **Plates 457, 476, BP 96, BP 97**


Clavicular branch
Pectoral branch
Acromial branch
Deltoid branch
Thoracoacromial a.
Axillary a.
Superior thoracic a.
Anterior circumflex humeral a.
Lateral thoracic a.
Posterior circumflex humeral a.
Subscapular a.
Circumflex scapular a.
Brachial a.
Thoracodorsal a.
Deep brachial a.
Lower margin of teres major m. is landmark for boundary between axillary and brachial aa.
Radial collateral a.
Middle collateral a.
Superior ulnar collateral a.
Inferior ulnar collateral a.
Radial recurrent a.
Recurrent interosseous a.
Anterior ulnar recurrent a.
Posterior interosseous a.
Posterior ulnar recurrent a.
Radial a.
Common interosseous a.
Anterior interosseous a.
Ulnar a.
Superficial palmar branch of radial a.
Deep palmar arch
Dorsal carpal a.
Princeps pollicis a.
Deep palmar branch of ulnar a.
Radialis indicis a.
Palmar metacarpal aa.
Superficial palmar arch
Palmar digital a.
Common palmar digital aa.
Proper palmar digital aa.

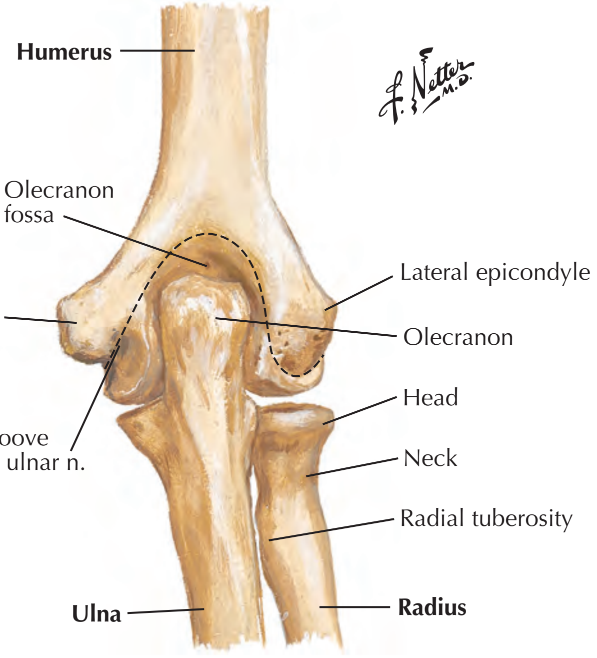

Axillary v.
Cephalic v.
Thoracodorsal v.
Basilic v.
Brachial vv.
Median cubital v.
Median antebrachial v.
Cephalic v.
Basilic v.
Anterior interosseous vv.
Ulnar v.
Perforating v.
Median basilic v.
Radial vv.
Ulnar vv.
Superficial venous palmar arch
Perforating v.
Dorsal venous network
Deep venous palmar arch
Palmar metacarpal vv.
Intercapitular vv.
Palmar digital vv.
■ Deep veins
■ Superficial veins
F. Netter M.D.


Pectoralis major m.
Pectoralis major tendon
Cephalic v.
Biceps brachii m.
Short head
Long head
Coracobrachialis m.
Humerus
Deltoid m.
Triceps brachii m.
Lateral head
Long head
Biceps brachii m.
Musculocutaneous n.
Brachialis m.
Cephalic v.
Radial n.
Posterior antebrachial cutaneous n.
Radial collateral a.
Middle collateral a.
Lateral intermuscular septum
Triceps brachii m.
Medial head
Lateral head
Long head
Biceps brachii m.
Cephalic v.
Brachialis m.
Brachioradialis m.
Radial n.
Extensor carpi radialis longus
Posterior antebrachial cutaneous n.
Musculocutaneous n.
Median n.
Medial antebrachial cutaneous n.
Brachial a. and vv.
Basilic v.
Deep brachial a.
Ulnar n.
Radial n.
Medial brachial cutaneous n.
Latissimus dorsi tendon
Teres major m.
Brachial fascia
Median n.
Brachial a. and vv.
Medial antebrachial cutaneous n.
Basilic v.
Medial brachial cutaneous n.
Ulnar n.
Superior ulnar collateral a.
Medial intermuscular septum
Brachial fascia
Lateral antebrachial cutaneous n.
Medial antebrachial cutaneous n.
Basilic v.
Median n.
Ulnar n.
Brachial a. and vv.
Medial intermuscular septum
Humerus
Triceps brachii m.
Lateral intermuscular septum

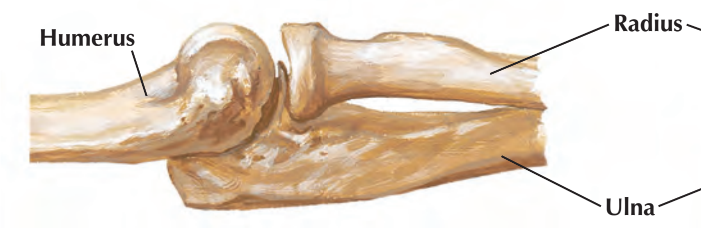
Right elbow


Humerus
Lateral supracondylar ridge
Medial supracondylar ridge
Radial fossa
Coronoid fossa
Lateral epicondyle
Medial epicondyle
Capitulum
Trochlea of humerus
Head
Coronoid process of ulna
Neck
Radial notch of ulna
Radial tuberosity
Tuberosity of ulna
Radius
Ulna

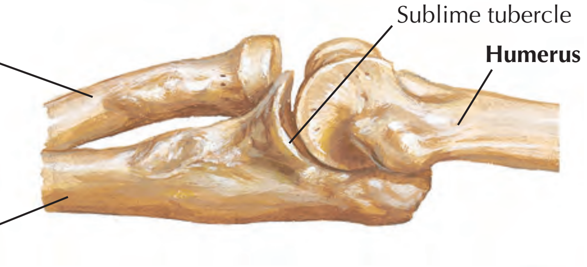
In extension: anterior view


Humerus
Olecranon fossa
Lateral epicondyle
Medial epicondyle
Olecranon
Head
Groove for ulnar n.
Neck
Radial tuberosity
Ulna
Radius

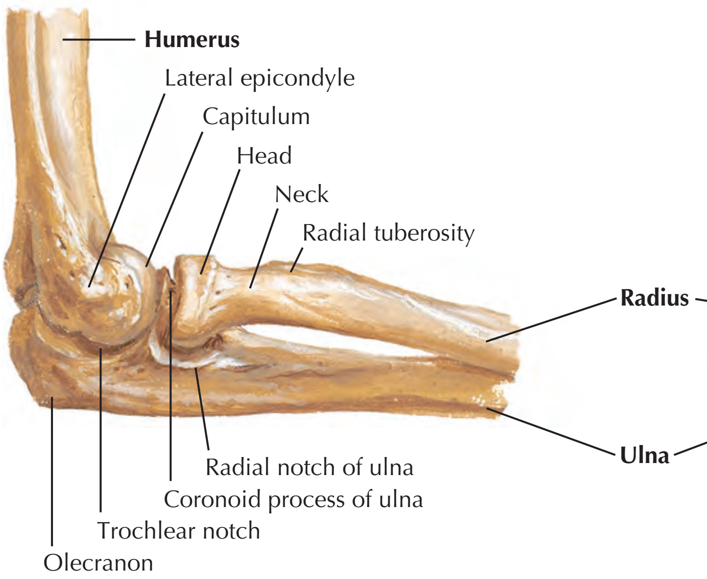
In extension: posterior view


Humerus
Radius
Ulna

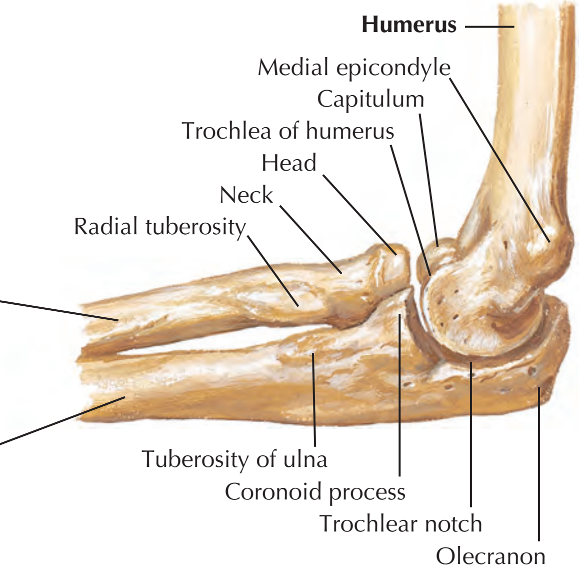
In extension: lateral view


Sublime tubercle
Humerus

In extension: medial view


Humerus
Lateral epicondyle
Capitulum
Head
Neck
Radial tuberosity
Radius
Ulna
Radial notch of ulna
Coronoid process of ulna
Trochlear notch
Olecranon

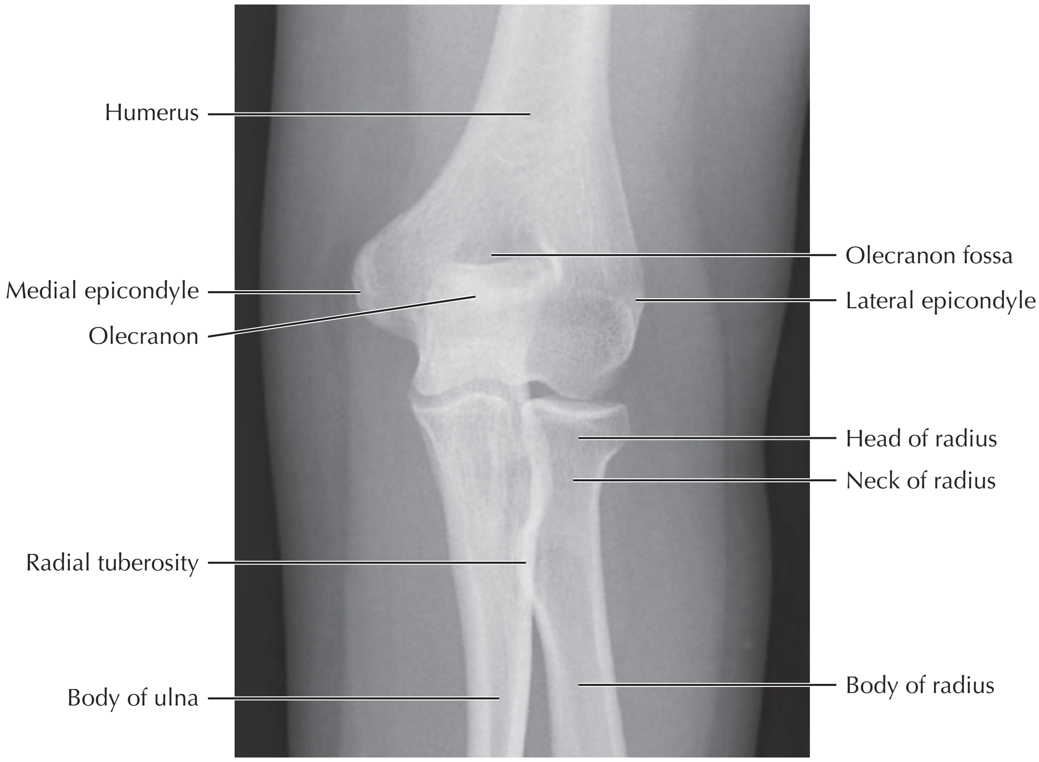
In 90 degrees of flexion: lateral view


Humerus
Medial epicondyle
Capitulum
Trochlea of humerus
Head
Neck
Radial tuberosity
Tuberosity of ulna
Coronoid process
Trochlear notch
Olecranon

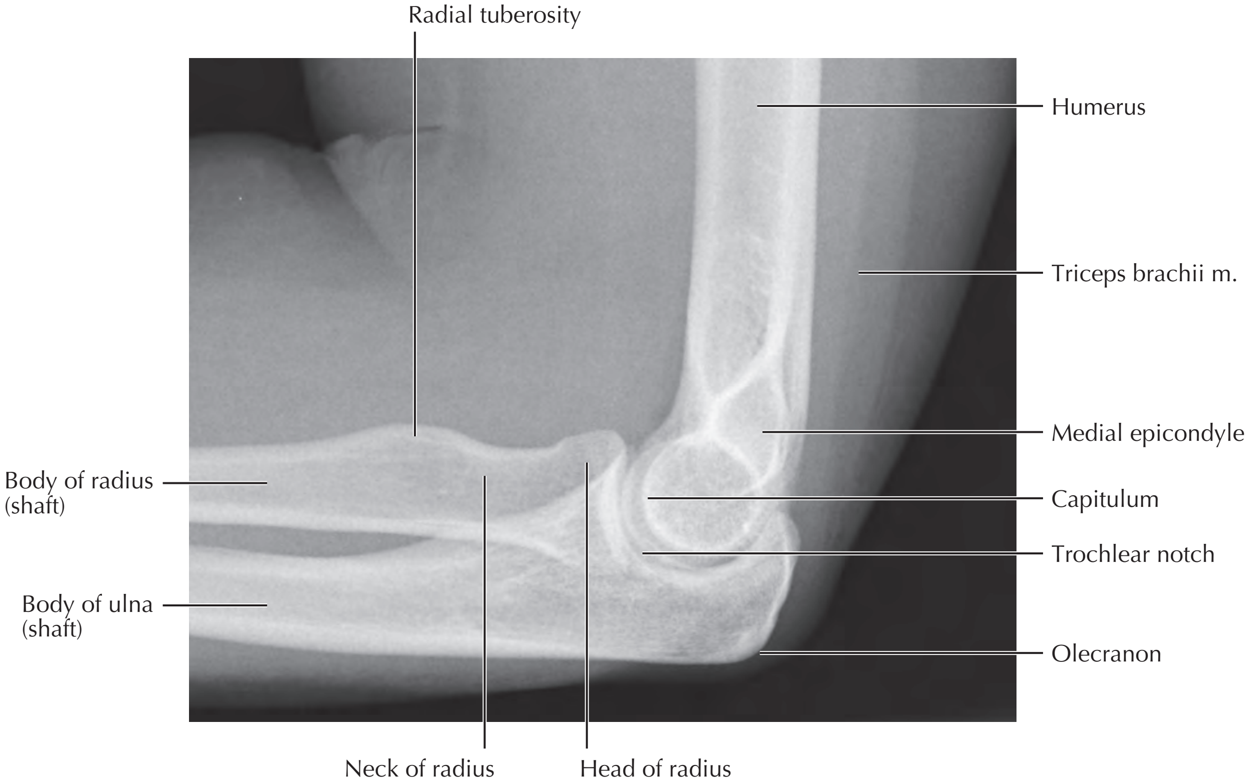
In 90 degrees of flexion: medial view

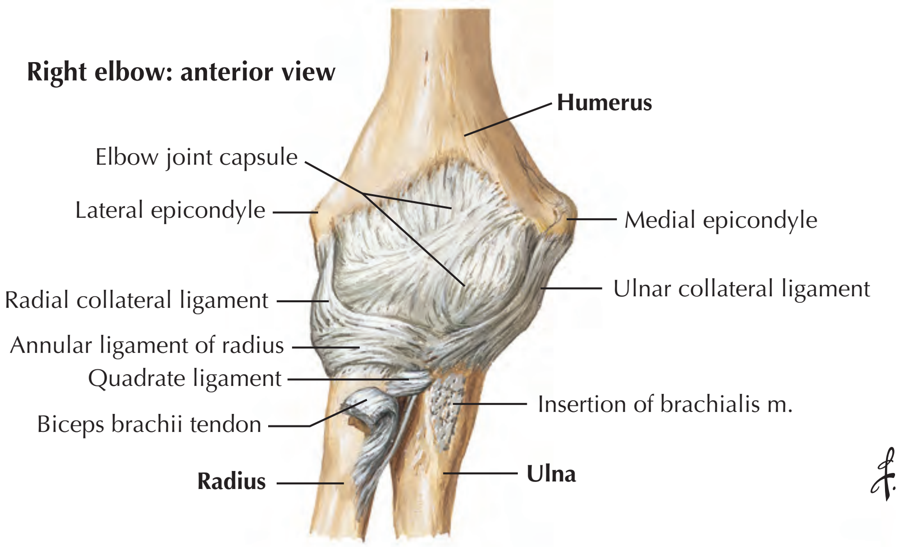
Elbow: Radiographs

Anteroposterior view

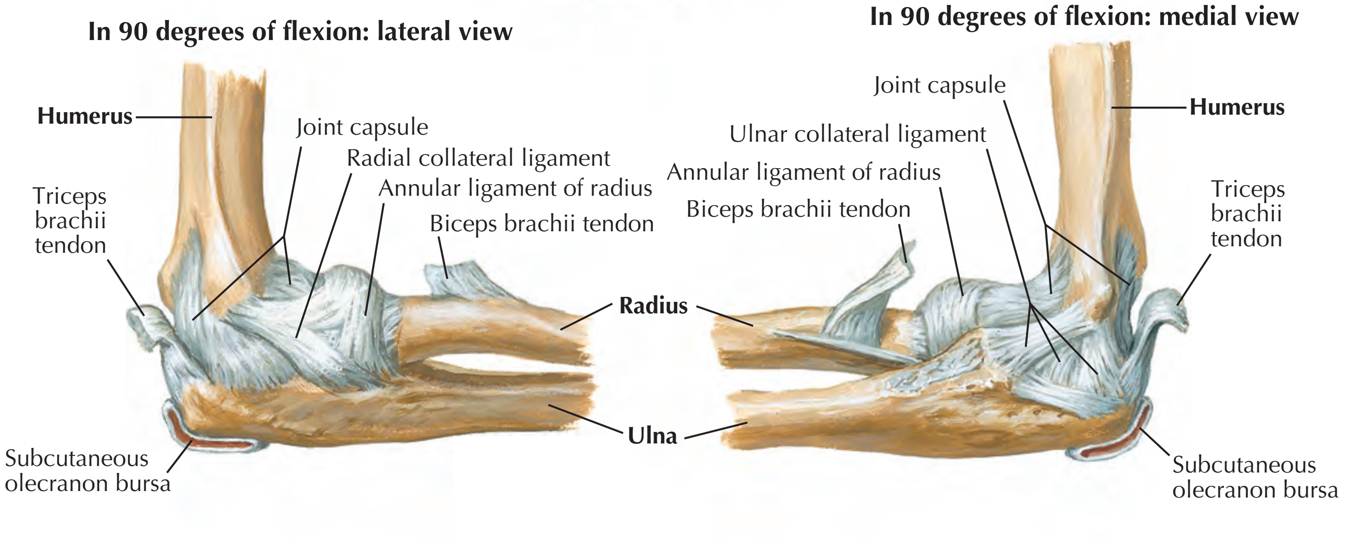

Humerus
Medial epicondyle
Olecranon
Radial tuberosity
Body of ulna
Olecranon fossa
Lateral epicondyle
Head of radius
Neck of radius
Body of radius

Lateral view

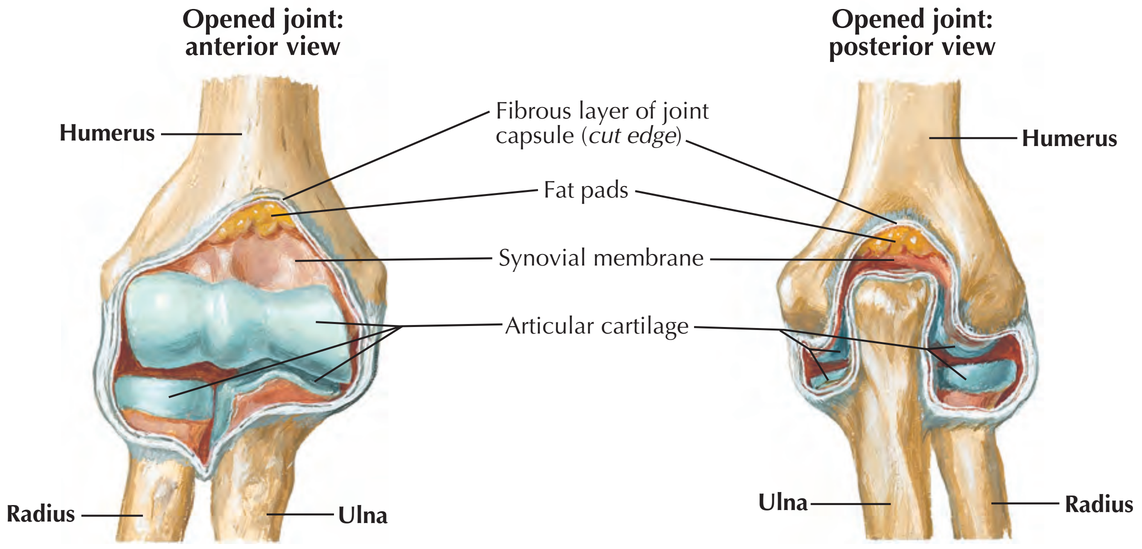

Radial tuberosity
Humerus
Triceps brachii m.
Body of radius (shaft)
Medial epicondyle
Capitulum
Trochlear notch
Body of ulna (shaft)
Olecranon
Neck of radius
Head of radius


Right elbow: anterior view
Humerus
Elbow joint capsule
Lateral epicondyle
Medial epicondyle
Radial collateral ligament
Ulnar collateral ligament
Annular ligament of radius
Quadrate ligament
Insertion of brachialis m.
Biceps brachii tendon
Radius
Ulna

F. Netter M.D.


In 90 degrees of flexion: lateral view

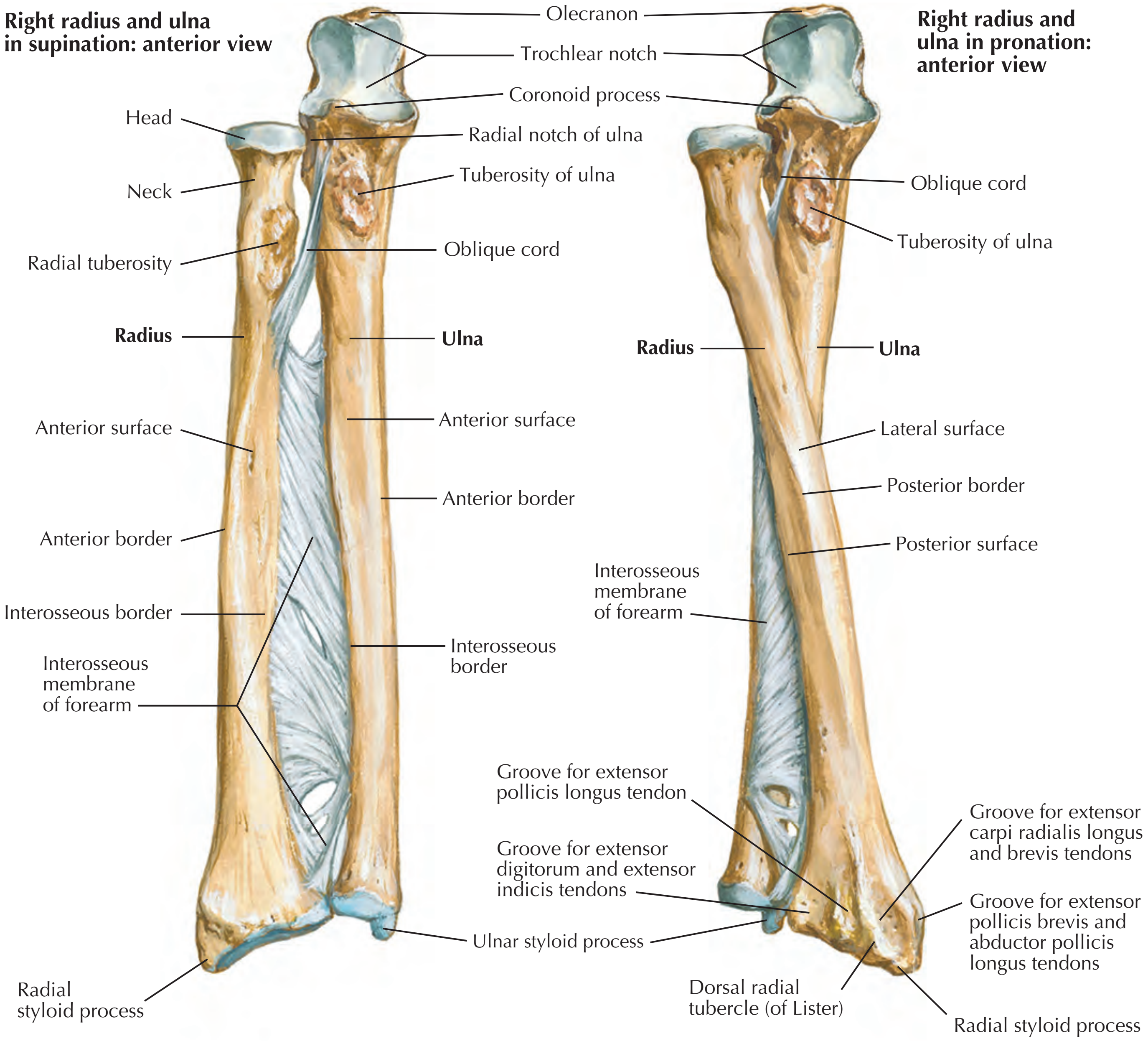
In 90 degrees of flexion: medial view
Humerus
Joint capsule
Radial collateral ligament
Annular ligament of radius
Biceps brachii tendon
Triceps brachii tendon
Radius
Ulna
Subcutaneous olecranon bursa
Joint capsule
Humerus
Ulnar collateral ligament
Annular ligament of radius
Biceps brachii tendon
Triceps brachii tendon
Subcutaneous olecranon bursa


Opened joint: anterior view

Opened joint: posterior view
Humerus
Fibrous layer of joint capsule (cut edge)
Humerus
Fat pads
Synovial membrane
Articular cartilage
Radius
Ulna
Ulna
Radius

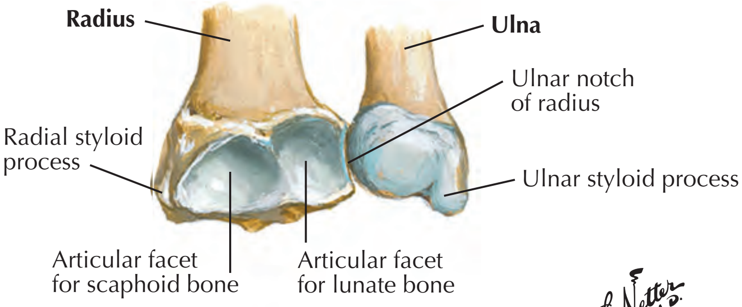
Bones of Forearm

See also **Plate 460**

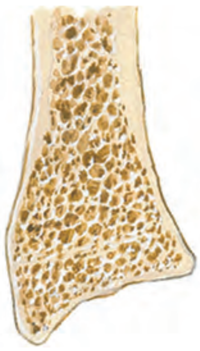

Right radius and ulna in supination: anterior view

Right radius and ulna in pronation: anterior view

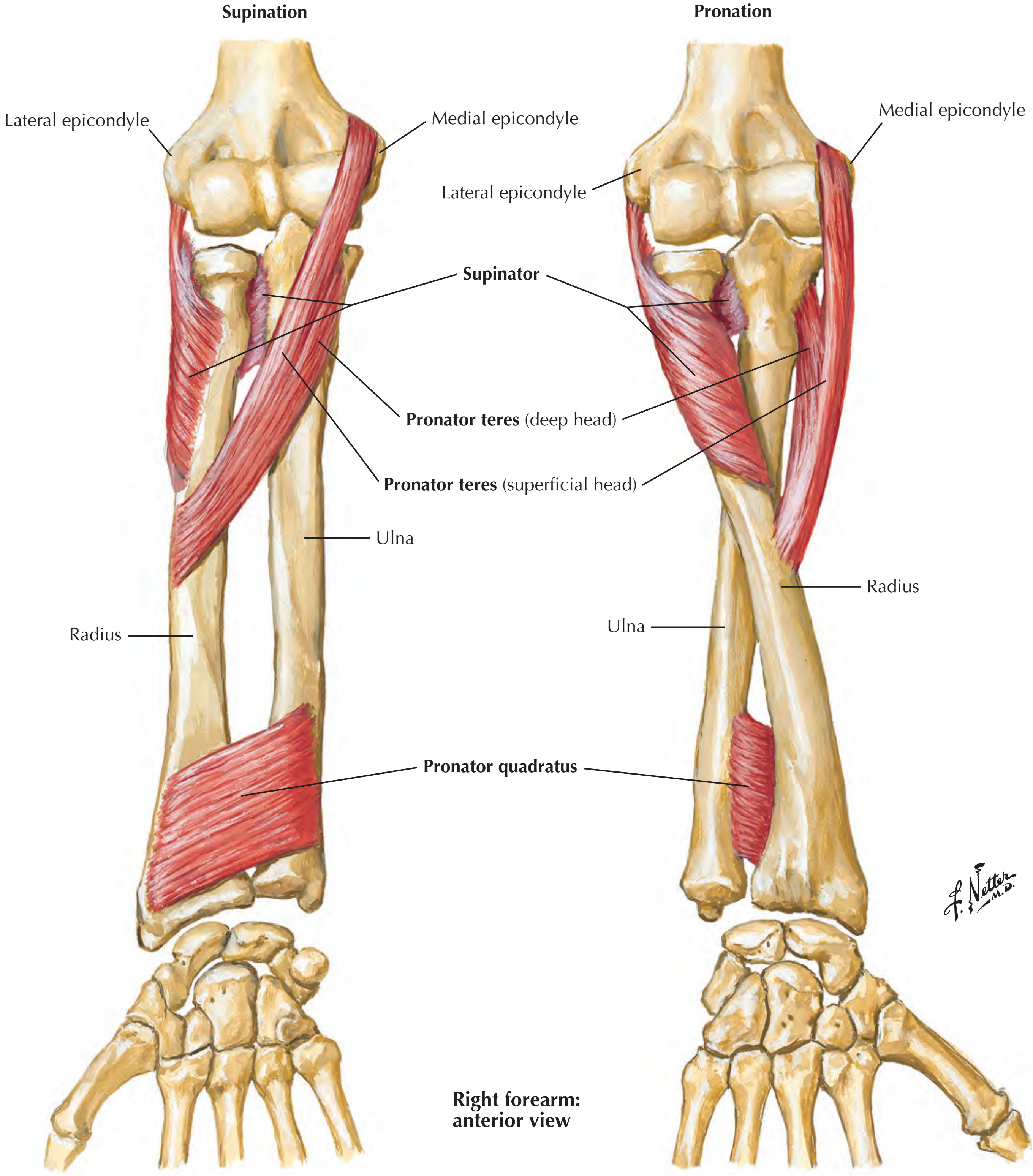
Olecranon
Trochlear notch
Coronoid process
Head
Radial notch of ulna
Neck
Tuberosity of ulna
Radial tuberosity
Oblique cord
Radius
Ulna
Anterior surface
Anterior surface
Anterior border
Anterior border
Interosseous border
Interosseous membrane of forearm
Interosseous border
Radial styloid process
Ulnar styloid process
Oblique cord
Tuberosity of ulna
Radius
Ulna
Lateral surface
Posterior border
Posterior surface
Interosseous membrane of forearm
Groove for extensor pollicis longus tendon
Groove for extensor carpi radialis longus and brevis tendons
Groove for extensor digitorum and extensor indicis tendons
Groove for extensor pollicis brevis and abductor pollicis longus tendons
Ulnar styloid process
Dorsal radial tubercle (of Lister)
Radial styloid process


Radius
Ulna
Ulnar notch of radius
Radial styloid process
Ulnar styloid process
Articular facet for scaphoid bone
Articular facet for lunate bone

Carpal articular surface


Radius (coronal section): the cortical bone of body of radius is thicker than that of the distal end of the radius

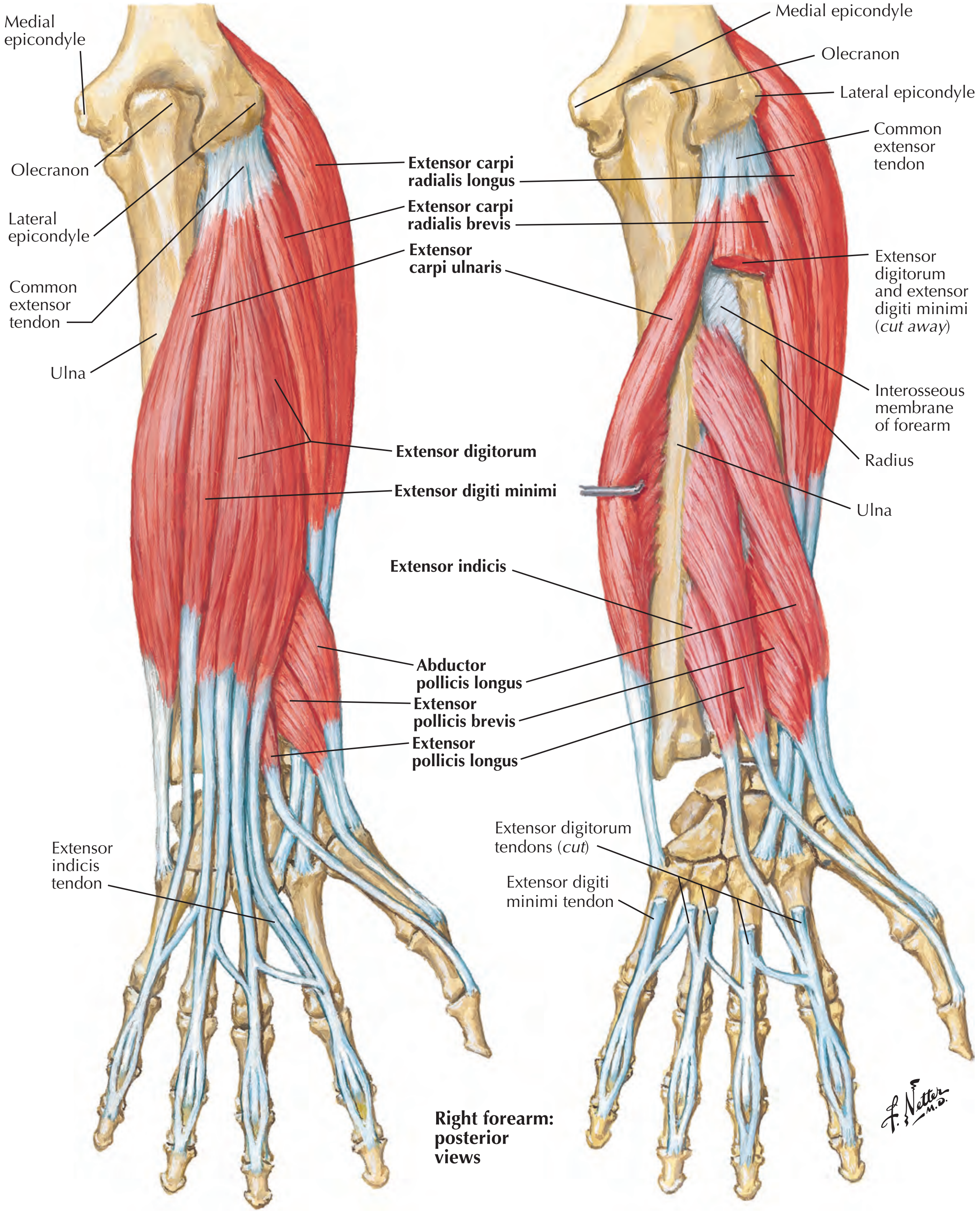
See also **Plate 458**


Supination
Pronation
Lateral epicondyle
Medial epicondyle
Lateral epicondyle
Medial epicondyle
Supinator
Pronator teres (deep head)
Pronator teres (superficial head)
Ulna
Radius
Radius
Ulna
Pronator quadratus
F. Netter M.D.

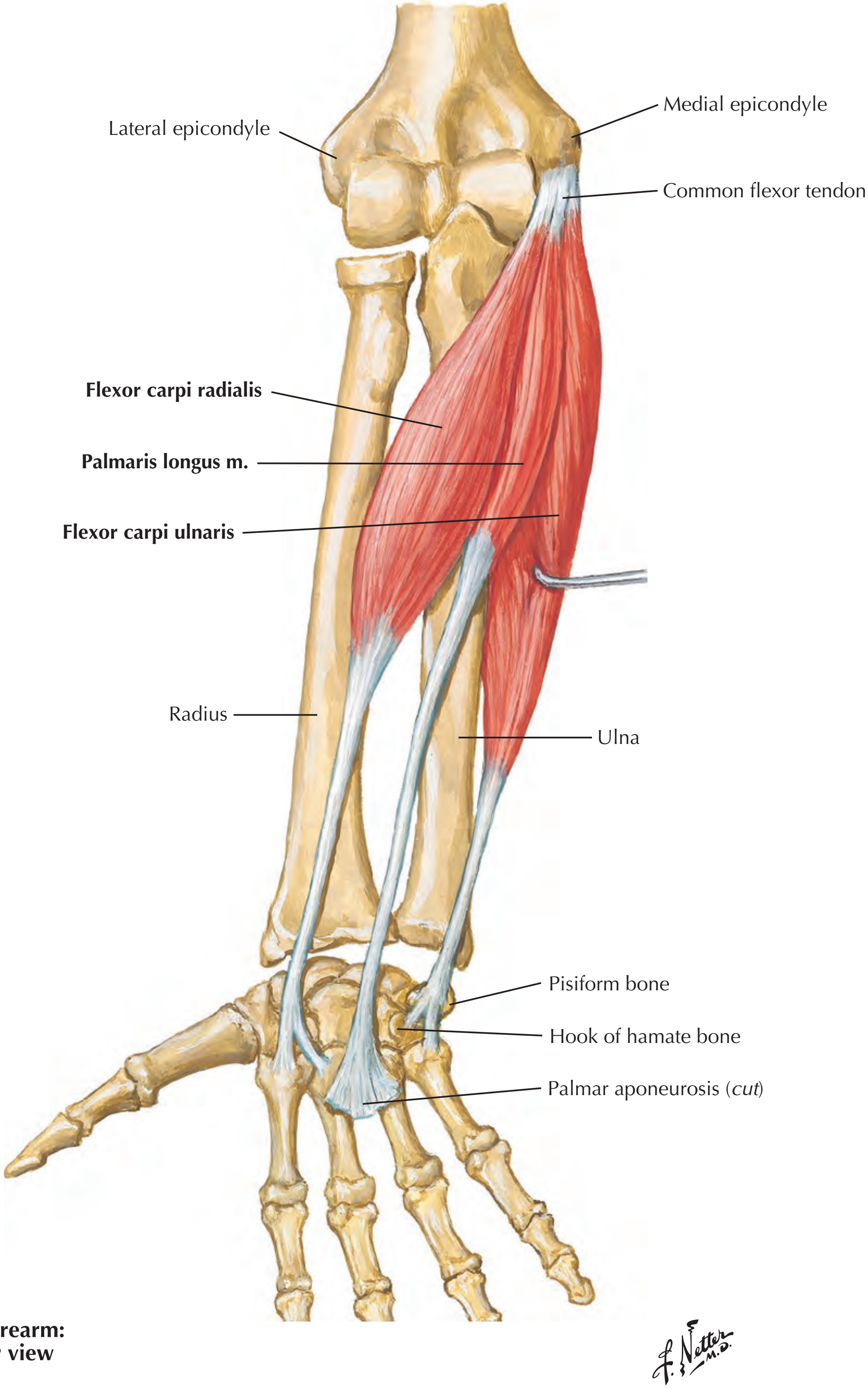
Right forearm: anterior view

Muscles of Forearm: Extensors of Wrist and Digits

See also **Plate 461**

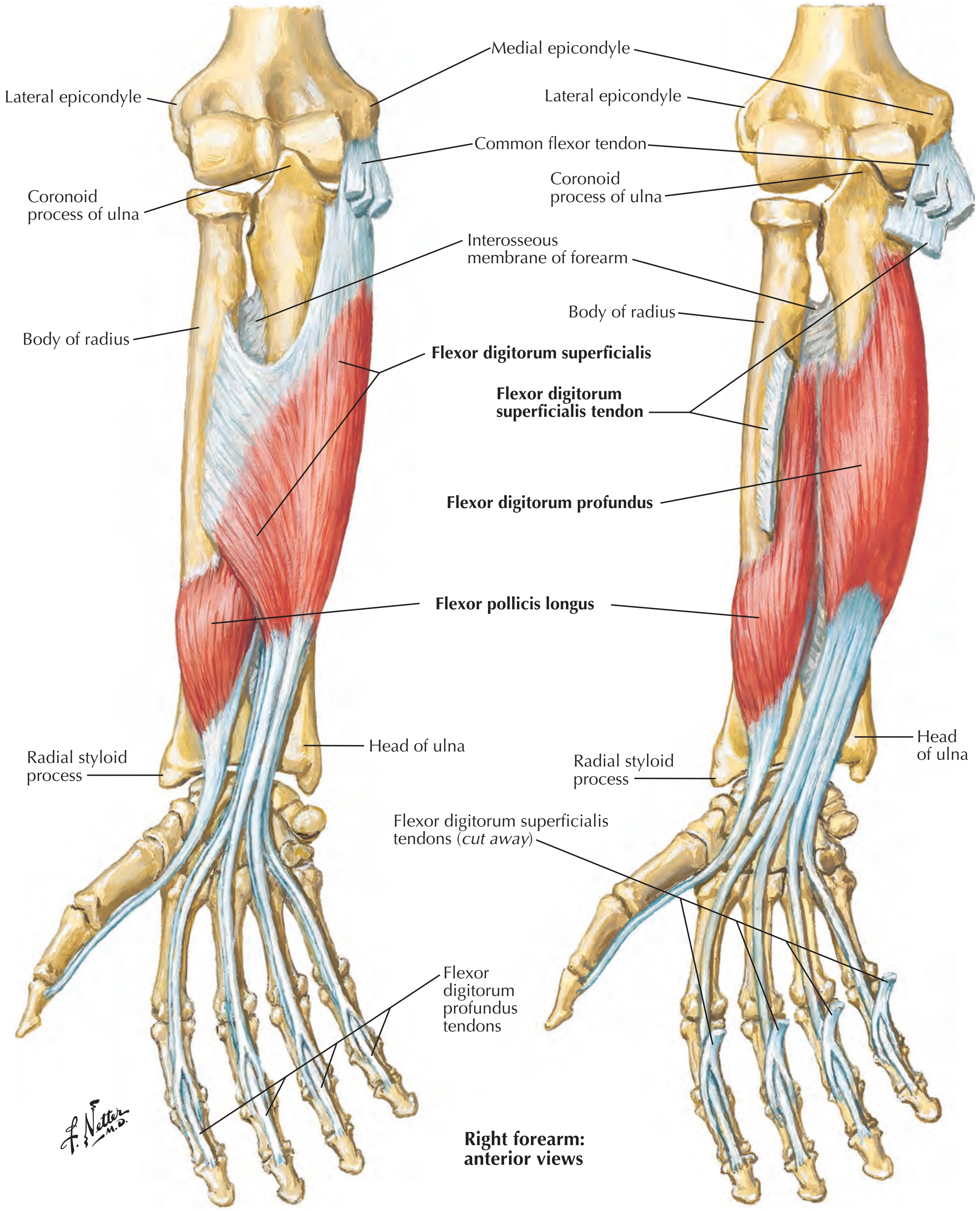

Medial epicondyle
Olecranon
Lateral epicondyle
Common extensor tendon
Ulna
Extensor carpi radialis longus
Extensor carpi radialis brevis
Extensor carpi ulnaris
Extensor digitorum
Extensor digiti minimi
Extensor indicis
Abductor pollicis longus
Extensor pollicis brevis
Extensor pollicis longus
Extensor indicis tendon
Medial epicondyle
Olecranon
Lateral epicondyle
Common extensor tendon
Extensor digitorum and extensor digiti minimi (*cut away*)
Interosseous membrane of forearm
Radius
Ulna
Extensor digitorum tendons (*cut*)
Extensor digiti minimi tendon

Right forearm: posterior views


Lateral epicondyle
Medial epicondyle
Common flexor tendon
Flexor carpi radialis
Palmaris longus m.
Flexor carpi ulnaris
Radius
Ulna
Pisiform bone
Hook of hamate bone
Palmar aponeurosis (*cut*)
F. Netter M.D.

Right forearm:
anterior view

Muscles of Forearm: Flexors of Digits

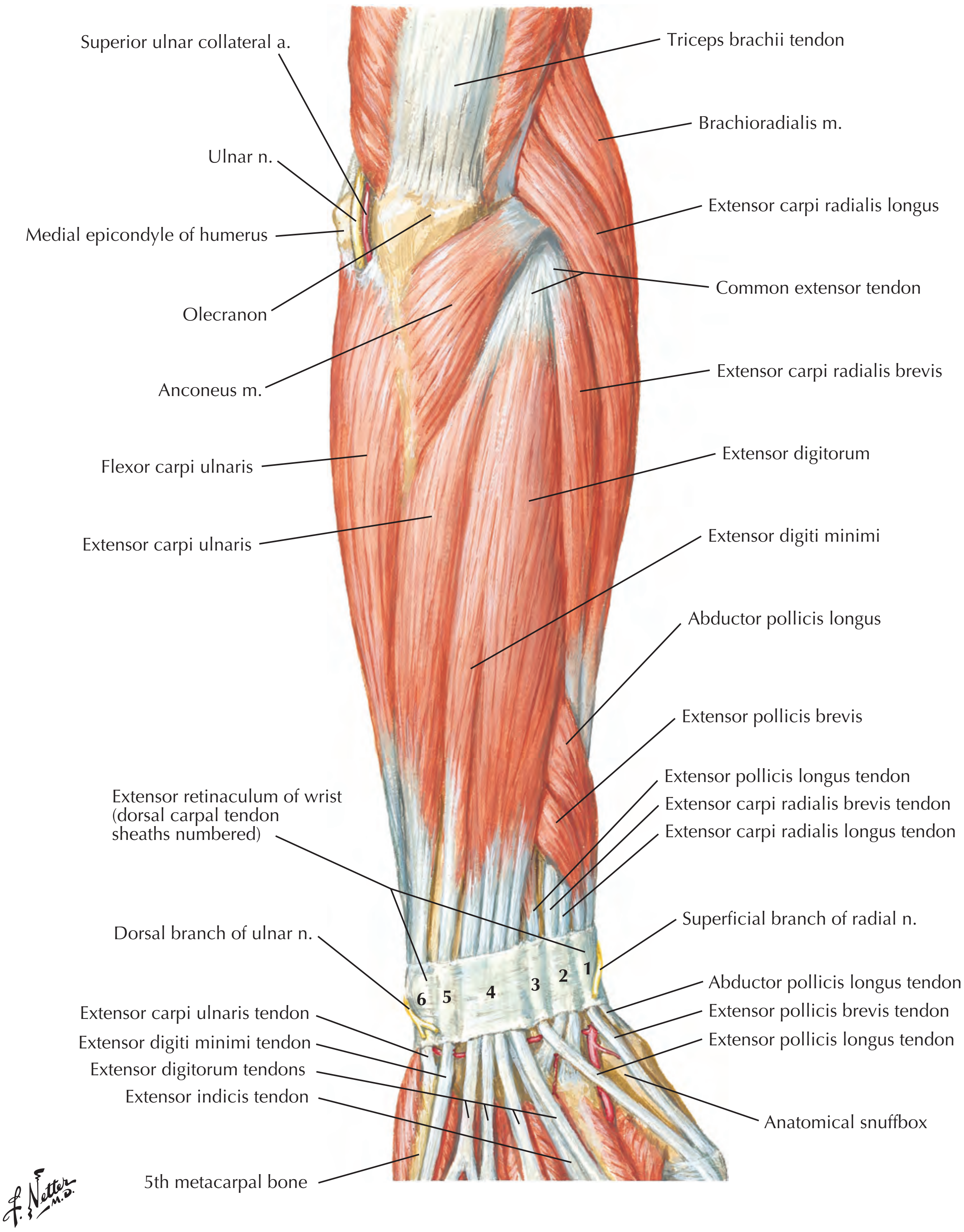


Medial epicondyle
Lateral epicondyle
Lateral epicondyle
Common flexor tendon
Coronoid process of ulna
Coronoid process of ulna
Interosseous membrane of forearm
Body of radius
Body of radius
Flexor digitorum superficialis
Flexor digitorum superficialis tendon
Flexor digitorum profundus
Flexor pollicis longus
Head of ulna
Head of ulna
Radial styloid process
Radial styloid process
Flexor digitorum superficialis tendons (*cut away*)
Flexor digitorum profundus tendons

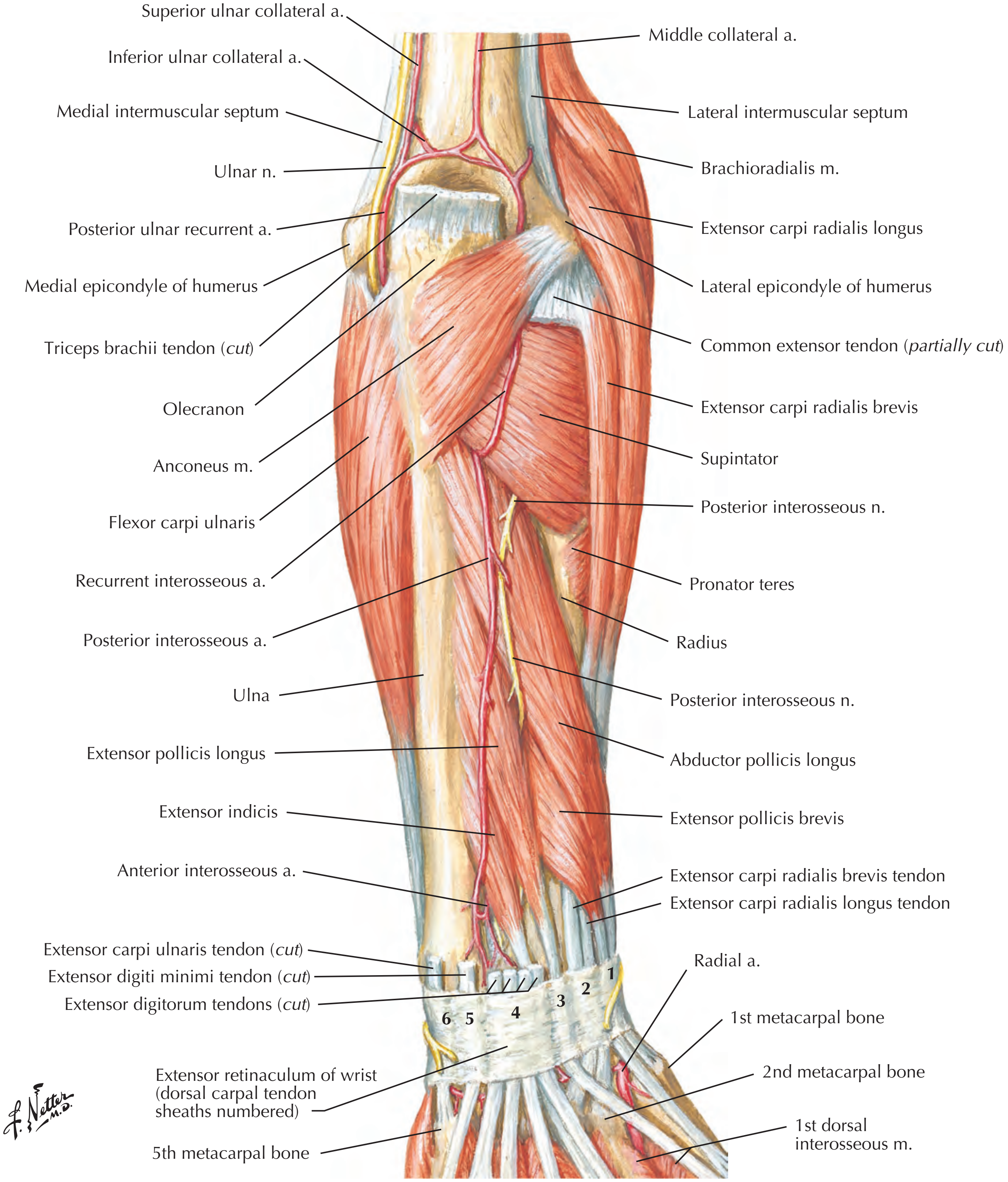
Right forearm: anterior views

Muscles of Forearm: Superficial Part of Posterior Compartment

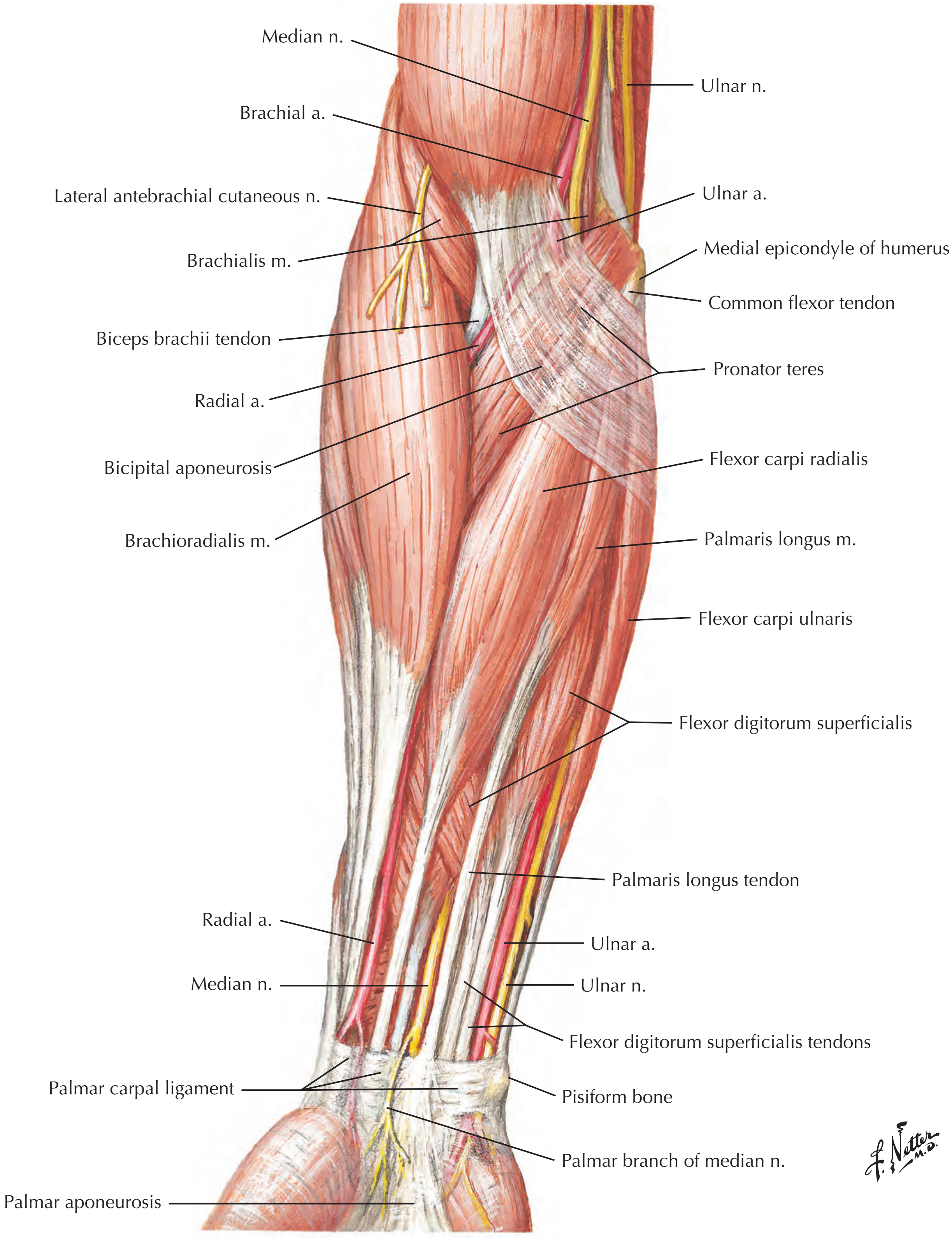
See also **Plates 480, 489**


Superior ulnar collateral a.
Ulnar n.
Medial epicondyle of humerus
Olecranon
Anconeus m.
Flexor carpi ulnaris
Extensor carpi ulnaris
Extensor retinaculum of wrist (dorsal carpal tendon sheaths numbered)
Dorsal branch of ulnar n.
Extensor carpi ulnaris tendon
Extensor digiti minimi tendon
Extensor digitorum tendons
Extensor indicis tendon
5th metacarpal bone
Triceps brachii tendon
Brachioradialis m.
Extensor carpi radialis longus
Common extensor tendon
Extensor carpi radialis brevis
Extensor digitorum
Extensor digiti minimi
Abductor pollicis longus
Extensor pollicis brevis
Extensor pollicis longus tendon
Extensor carpi radialis brevis tendon
Extensor carpi radialis longus tendon
Superficial branch of radial n.
Abductor pollicis longus tendon
Extensor pollicis brevis tendon
Extensor pollicis longus tendon
Anatomical snuffbox
6
5
4
3
2
1
F. Netter M.D.

See also **Plate 480**

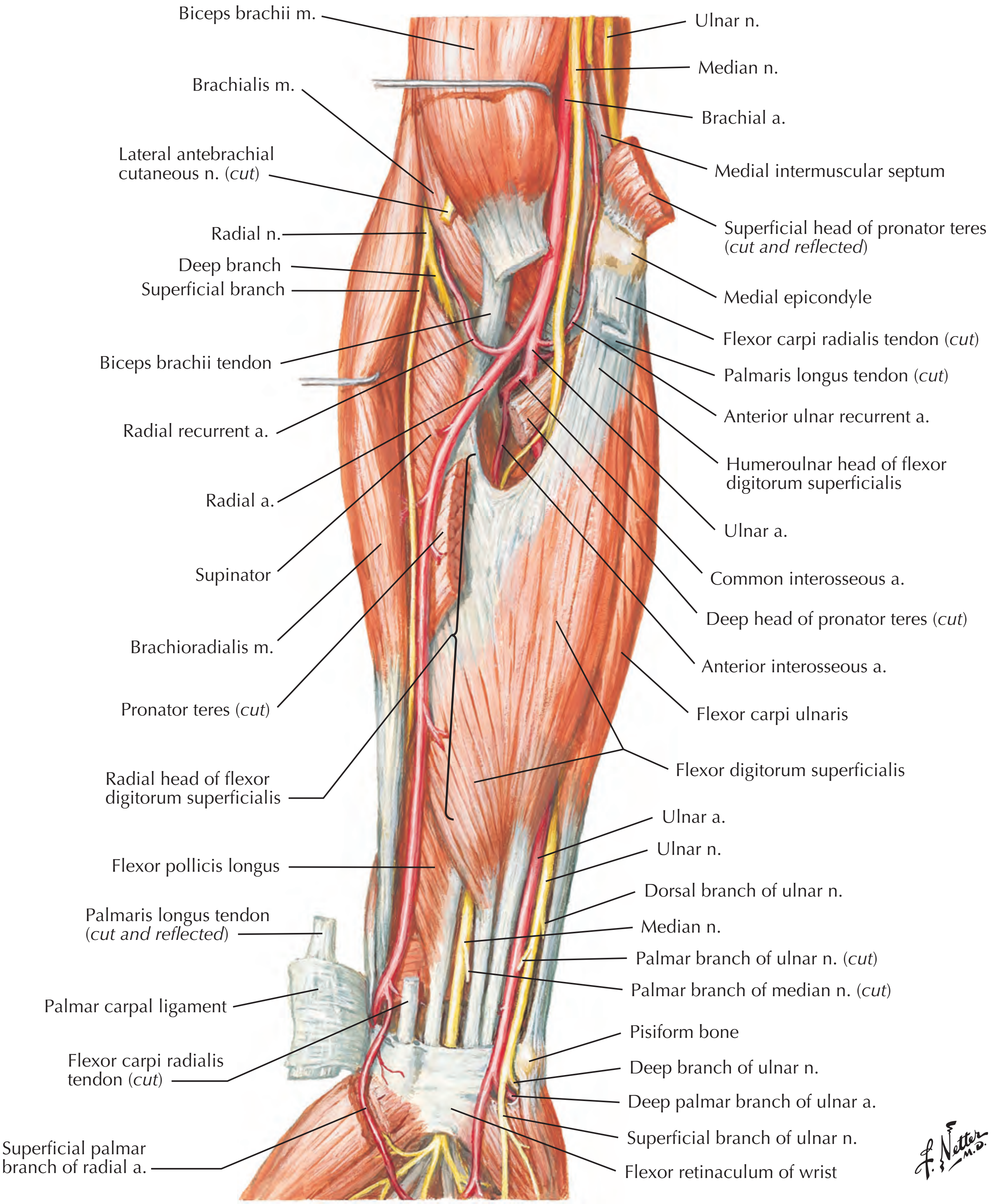

Superior ulnar collateral a.
Inferior ulnar collateral a.
Medial intermuscular septum
Ulnar n.
Posterior ulnar recurrent a.
Medial epicondyle of humerus
Triceps brachii tendon (*cut*)
Olecranon
Anconeus m.
Flexor carpi ulnaris
Recurrent interosseous a.
Posterior interosseous a.
Ulna
Extensor pollicis longus
Extensor indicis
Anterior interosseous a.
Extensor carpi ulnaris tendon (*cut*)
Extensor digiti minimi tendon (*cut*)
Extensor digitorum tendons (*cut*)
Extensor retinaculum of wrist (dorsal carpal tendon sheaths numbered)
5th metacarpal bone
Middle collateral a.
Lateral intermuscular septum
Brachioradialis m.
Extensor carpi radialis longus
Lateral epicondyle of humerus
Common extensor tendon (*partially cut*)
Extensor carpi radialis brevis
Supintator
Posterior interosseous n.
Pronator teres
Radius
Posterior interosseous n.
Abductor pollicis longus
Extensor pollicis brevis
Extensor carpi radialis brevis tendon
Extensor carpi radialis longus tendon
Radial a.
1
2
3
4
5
6
1st metacarpal bone
2nd metacarpal bone
1st dorsal interosseous m.
F. Netter M.D.

See also **Plates 486, 487**

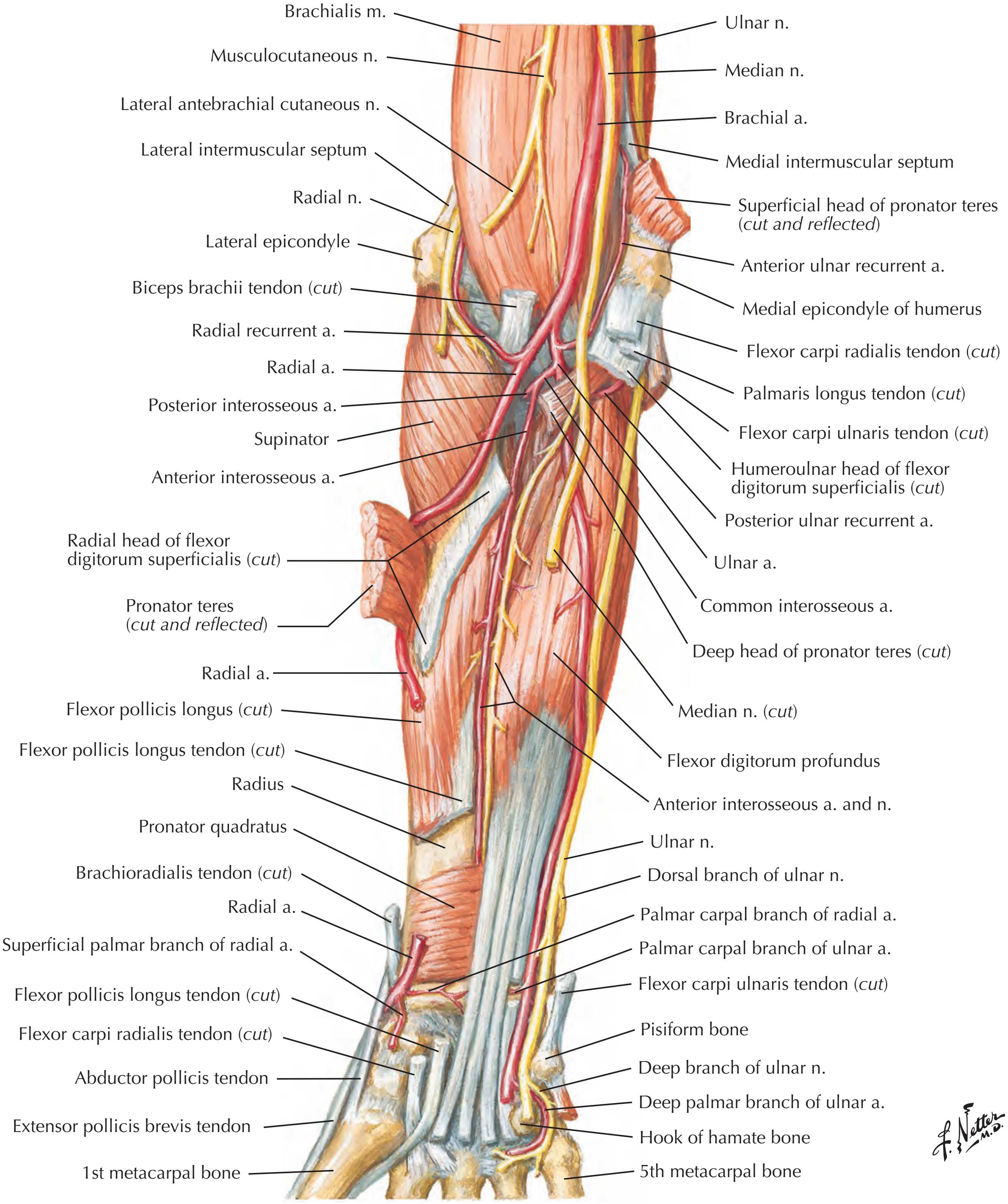

Median n.
Brachial a.
Lateral antebrachial cutaneous n.
Brachialis m.
Biceps brachii tendon
Radial a.
Bicipital aponeurosis
Brachioradialis m.
Ulnar n.
Ulnar a.
Medial epicondyle of humerus
Common flexor tendon
Pronator teres
Flexor carpi radialis
Palmaris longus m.
Flexor carpi ulnaris
Flexor digitorum superficialis
Palmaris longus tendon
Radial a.
Median n.
Ulnar a.
Ulnar n.
Flexor digitorum superficialis tendons
Palmar carpal ligament
Pisiform bone
Palmar branch of median n.
Palmar aponeurosis
F. Netter M.D.

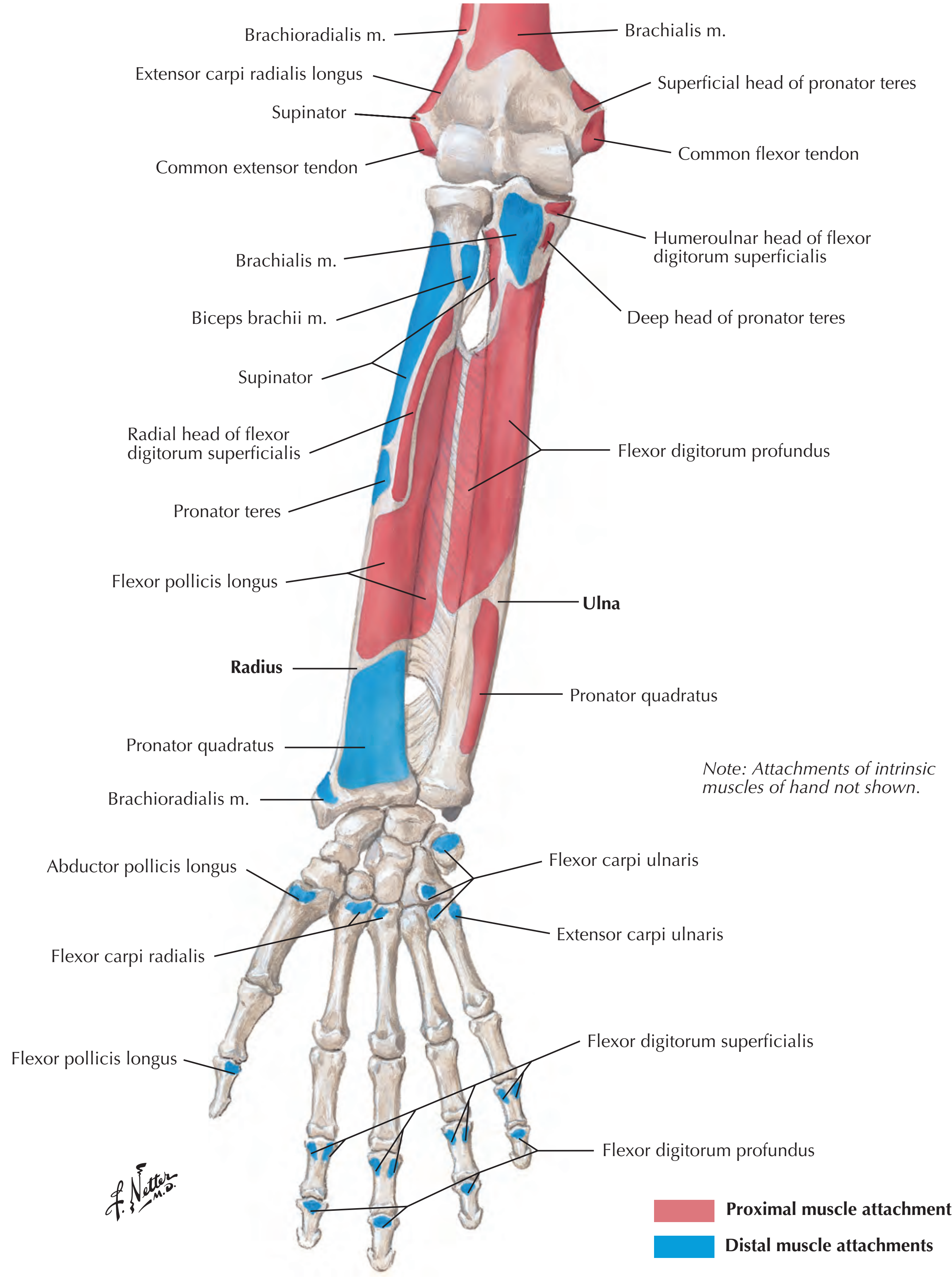
Muscles of Forearm: Anterior Compartment

See also **Plates 443, 486**


Biceps brachii m.
Brachialis m.
Lateral antebrachial cutaneous n. (*cut*)
Radial n.
Deep branch
Superficial branch
Biceps brachii tendon
Radial recurrent a.
Radial a.
Supinator
Brachioradialis m.
Pronator teres (*cut*)
Radial head of flexor digitorum superficialis
Flexor pollicis longus
Palmaris longus tendon (*cut and reflected*)
Palmar carpal ligament
Flexor carpi radialis tendon (*cut*)
Superficial palmar branch of radial a.
Ulnar n.
Median n.
Brachial a.
Medial intermuscular septum
Superficial head of pronator teres (*cut and reflected*)
Medial epicondyle
Flexor carpi radialis tendon (*cut*)
Palmaris longus tendon (*cut*)
Anterior ulnar recurrent a.
Humeroulnar head of flexor digitorum superficialis
Ulnar a.
Common interosseous a.
Deep head of pronator teres (*cut*)
Anterior interosseous a.
Flexor carpi ulnaris
Flexor digitorum superficialis
Ulnar a.
Ulnar n.
Dorsal branch of ulnar n.
Median n.
Palmar branch of ulnar n. (*cut*)
Palmar branch of median n. (*cut*)
Pisiform bone
Deep branch of ulnar n.
Deep palmar branch of ulnar a.
Superficial branch of ulnar n.
Flexor retinaculum of wrist

See also **Plates 440, 487**


Brachialis m.
Musculocutaneous n.
Lateral antebrachial cutaneous n.
Lateral intermuscular septum
Radial n.
Lateral epicondyle
Biceps brachii tendon (*cut*)
Radial recurrent a.
Radial a.
Posterior interosseous a.
Supinator
Anterior interosseous a.
Radial head of flexor digitorum superficialis (*cut*)
Pronator teres (*cut and reflected*)
Radial a.
Flexor pollicis longus (*cut*)
Flexor pollicis longus tendon (*cut*)
Radius
Pronator quadratus
Brachioradialis tendon (*cut*)
Radial a.
Superficial palmar branch of radial a.
Flexor pollicis longus tendon (*cut*)
Flexor carpi radialis tendon (*cut*)
Abductor pollicis tendon
Extensor pollicis brevis tendon
1st metacarpal bone
Ulnar n.
Median n.
Brachial a.
Medial intermuscular septum
Superficial head of pronator teres (*cut and reflected*)
Anterior ulnar recurrent a.
Medial epicondyle of humerus
Flexor carpi radialis tendon (*cut*)
Palmaris longus tendon (*cut*)
Flexor carpi ulnaris tendon (*cut*)
Humeroulnar head of flexor digitorum superficialis (*cut*)
Posterior ulnar recurrent a.
Ulnar a.
Common interosseous a.
Deep head of pronator teres (*cut*)
Median n. (*cut*)
Flexor digitorum profundus
Anterior interosseous a. and n.
Ulnar n.
Dorsal branch of ulnar n.
Palmar carpal branch of radial a.
Palmar carpal branch of ulnar a.
Flexor carpi ulnaris tendon (*cut*)
Pisiform bone
Deep branch of ulnar n.
Deep palmar branch of ulnar a.
Hook of hamate bone
5th metacarpal bone
F. Netter M.D.


Brachioradialis m.
Brachialis m.
Extensor carpi radialis longus
Superficial head of pronator teres
Supinator
Common extensor tendon
Common flexor tendon
Brachialis m.
Humeroulnar head of flexor digitorum superficialis
Biceps brachii m.
Deep head of pronator teres
Supinator
Radial head of flexor digitorum superficialis
Flexor digitorum profundus
Pronator teres
Flexor pollicis longus
Ulna
Radius
Pronator quadratus
Pronator quadratus
Brachioradialis m.
Abductor pollicis longus
Flexor carpi ulnaris
Extensor carpi ulnaris
Flexor carpi radialis
Flexor digitorum superficialis
Flexor pollicis longus
Flexor digitorum profundus

Note: Attachments of intrinsic muscles of hand not shown.

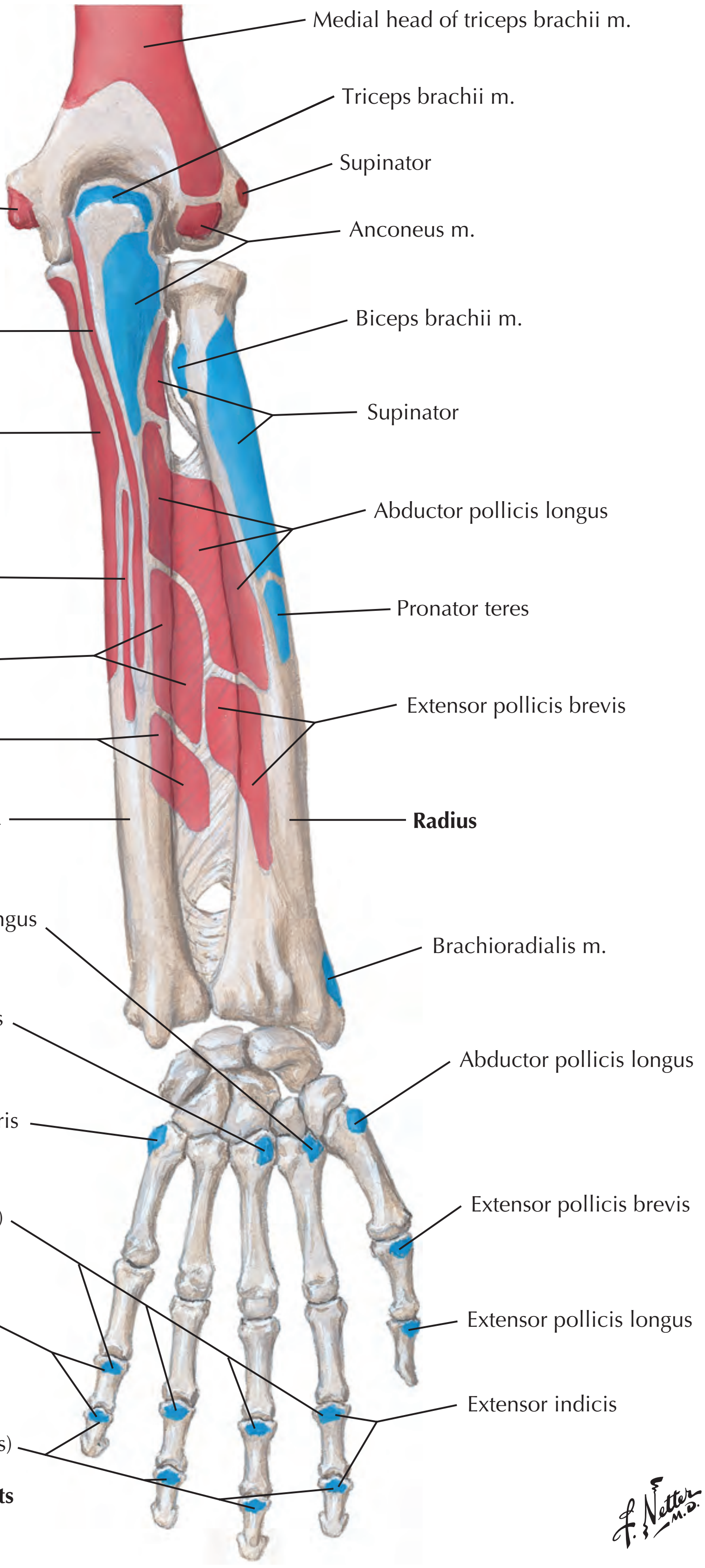
🟥 **Proximal muscle attachments**

🟦 **Distal muscle attachments**

Attachments of Muscles of Forearm: Posterior View

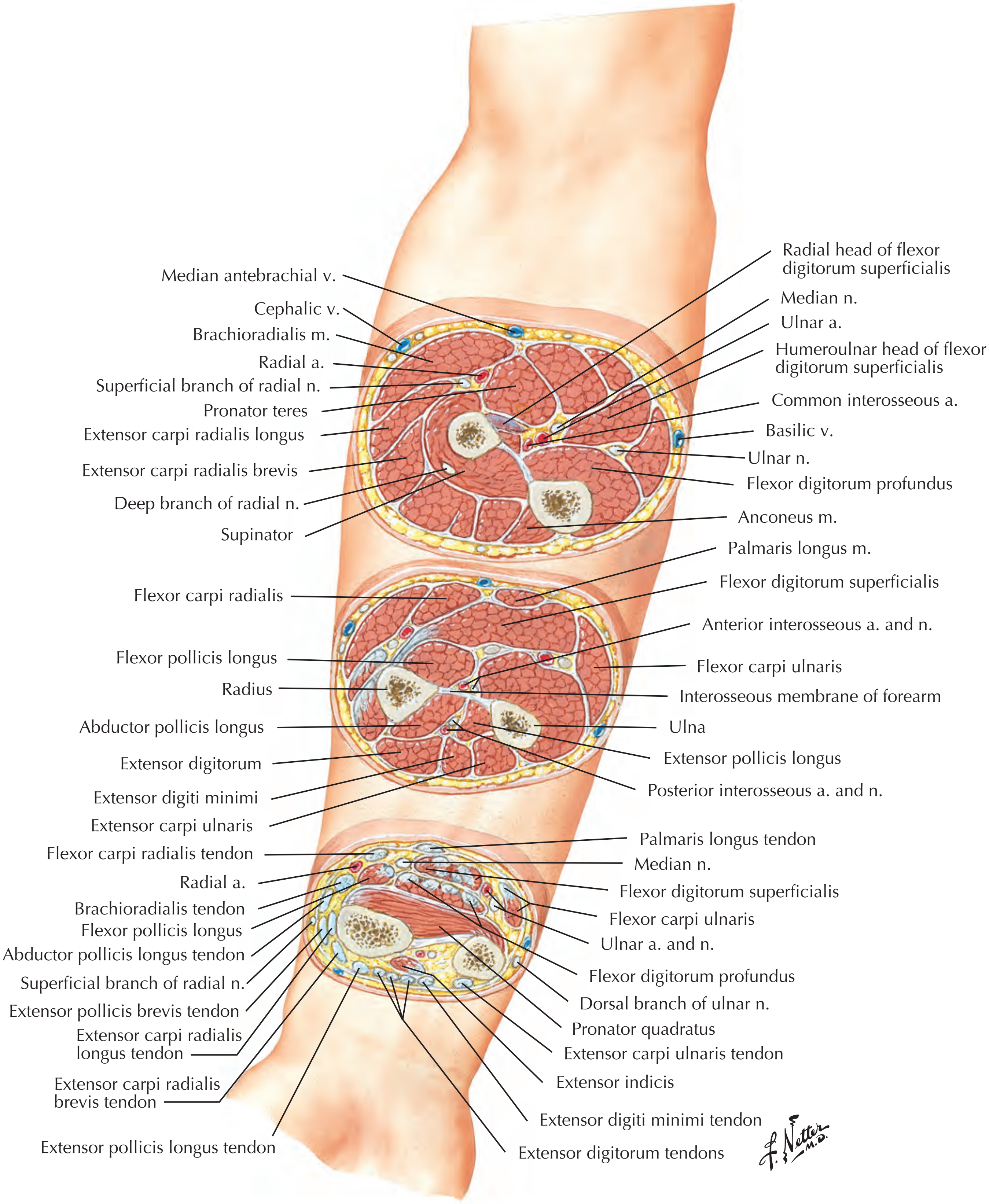
See also **Plate 451**

Note: Attachments of intrinsic muscles of hand not shown.

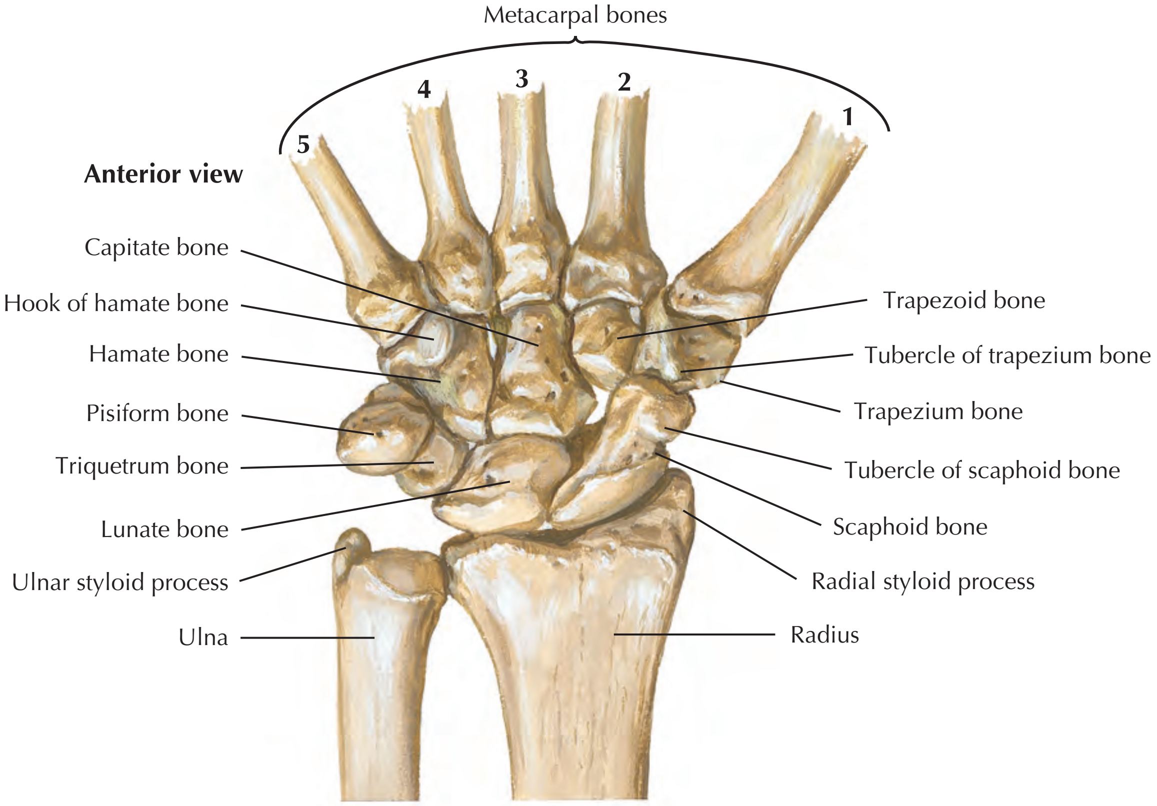

Medial head of triceps brachii m.
Triceps brachii m.
Supinator
Humeral head of flexor carpi ulnaris (via common flexor tendon)
Anconeus m.
Biceps brachii m.
Ulnar head of flexor carpi ulnaris
Supinator
Flexor digitorum profundus
Abductor pollicis longus
Ulnar head of extensor carpi ulnaris
Pronator teres
Extensor pollicis longus
Extensor pollicis brevis
Extensor indicis
Ulna
Radius
Extensor carpi radialis longus
Brachioradialis m.
Extensor carpi radialis brevis
Abductor pollicis longus
Extensor carpi ulnaris
Extensor pollicis brevis
Extensor digitorum (central bands)
Extensor digiti minimi
Extensor pollicis longus
Extensor indicis
Extensor digitorum (lateral bands)
F. Netter M.D.

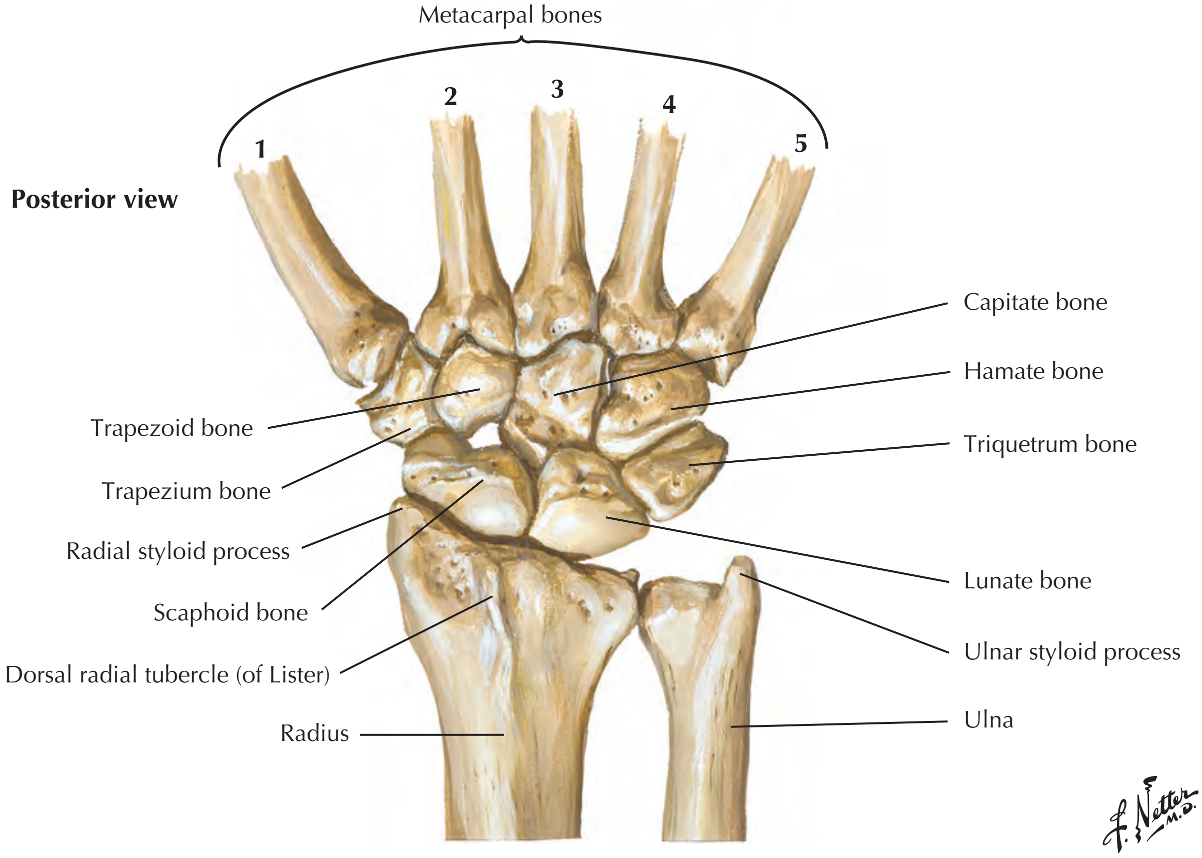
🟥 **Proximal muscle attachments**

🟦 **Distal muscle attachments**


Median antebrachial v.
Cephalic v.
Brachioradialis m.
Radial a.
Superficial branch of radial n.
Pronator teres
Extensor carpi radialis longus
Extensor carpi radialis brevis
Deep branch of radial n.
Supinator
Radial head of flexor digitorum superficialis
Median n.
Ulnar a.
Humeroulnar head of flexor digitorum superficialis
Common interosseous a.
Basilic v.
Ulnar n.
Flexor digitorum profundus
Anconeus m.
Flexor carpi radialis
Flexor pollicis longus
Radius
Abductor pollicis longus
Extensor digitorum
Extensor digiti minimi
Extensor carpi ulnaris
Palmaris longus m.
Flexor digitorum superficialis
Anterior interosseous a. and n.
Flexor carpi ulnaris
Interosseous membrane of forearm
Ulna
Extensor pollicis longus
Posterior interosseous a. and n.
Flexor carpi radialis tendon
Radial a.
Brachioradialis tendon
Flexor pollicis longus
Abductor pollicis longus tendon
Superficial branch of radial n.
Extensor pollicis brevis tendon
Extensor carpi radialis longus tendon
Extensor carpi radialis brevis tendon
Extensor pollicis longus tendon
Palmaris longus tendon
Median n.
Flexor digitorum superficialis
Flexor carpi ulnaris
Ulnar a. and n.
Flexor digitorum profundus
Dorsal branch of ulnar n.
Pronator quadratus
Extensor carpi ulnaris tendon
Extensor indicis
Extensor digiti minimi tendon
Extensor digitorum tendons
F. Netter M.D.

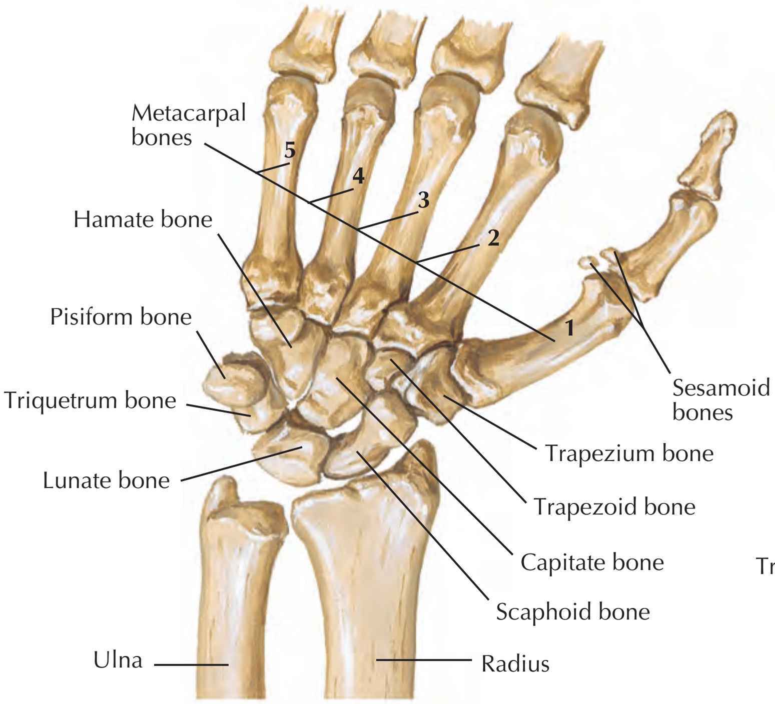
Carpal Bones


Metacarpal bones
5
4
3
2
1
Anterior view
Capitate bone
Hook of hamate bone
Hamate bone
Pisiform bone
Triquetrum bone
Lunate bone
Ulnar styloid process
Ulna
Trapezoid bone
Tubercle of trapezium bone
Trapezium bone
Tubercle of scaphoid bone
Scaphoid bone
Radial styloid process
Radius

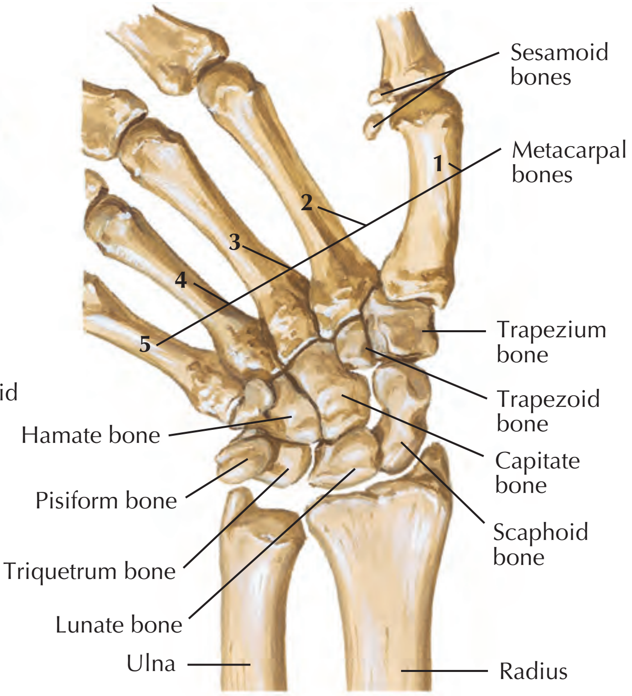

Metacarpal bones
1
2
3
4
5
Posterior view
Capitate bone
Hamate bone
Triquetrum bone
Trapezoid bone
Trapezium bone
Radial styloid process
Scaphoid bone
Dorsal radial tubercle (of Lister)
Radius
Lunate bone
Ulnar styloid process
Ulna
F. Netter M.D.

Movements of Wrist

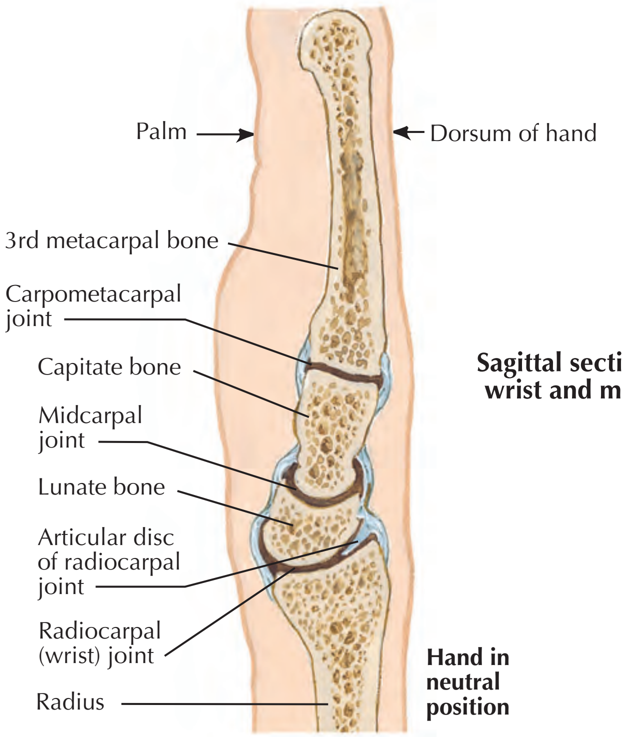
See also **Plates 466, 467**


Metacarpal bones
5
4
3
2
1
Hamate bone
Pisiform bone
Triquetrum bone
Lunate bone
Ulna
Sesamoid bones
Trapezium bone
Trapezoid bone
Capitate bone
Scaphoid bone
Radius

Position of carpal bones with hand abducted anterior view

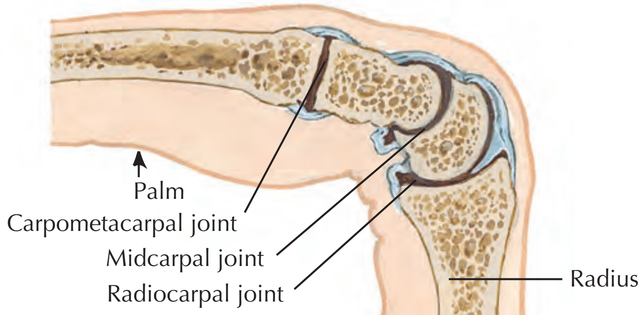

Sesamoid bones
Metacarpal bones
1
2
3
4
5
Trapezium bone
Trapezoid bone
Capitate bone
Scaphoid bone
Hamate bone
Pisiform bone
Triquetrum bone
Lunate bone
Ulna
Radius

Position of carpal bones with hand adducted anterior view

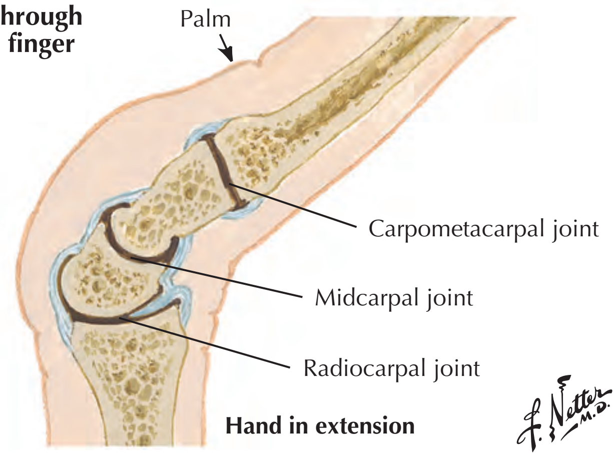

Palm
Dorsum of hand
3rd metacarpal bone
Carpometacarpal joint
Capitate bone
Midcarpal joint
Lunate bone
Articular disc of radiocarpal joint
Radiocarpal (wrist) joint
Radius

Hand in neutral position

Sagittal sections through wrist and middle finger


Palm
Carpometacarpal joint
Midcarpal joint
Radiocarpal joint
Radius

Hand in flexion


Palm
Carpometacarpal joint
Midcarpal joint
Radiocarpal joint

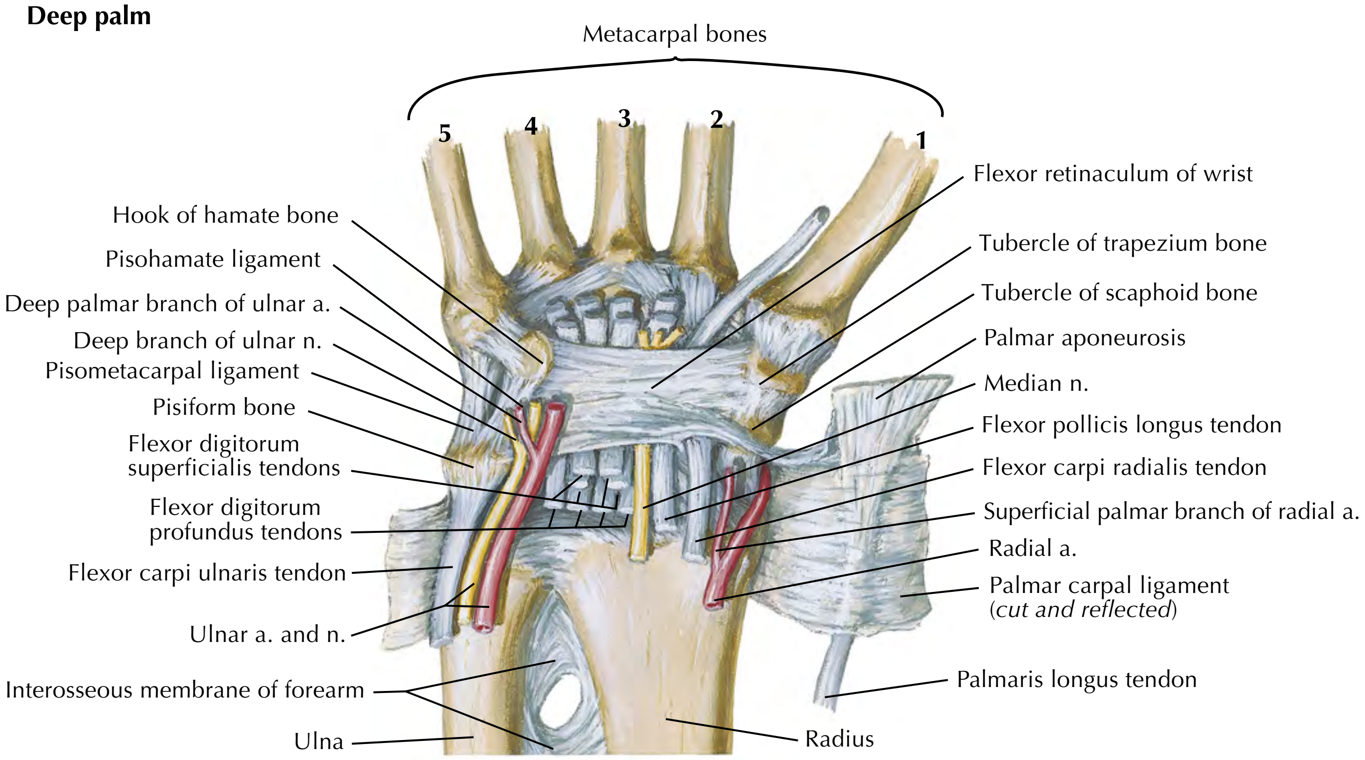
Hand in extension

F. Netter M.D.

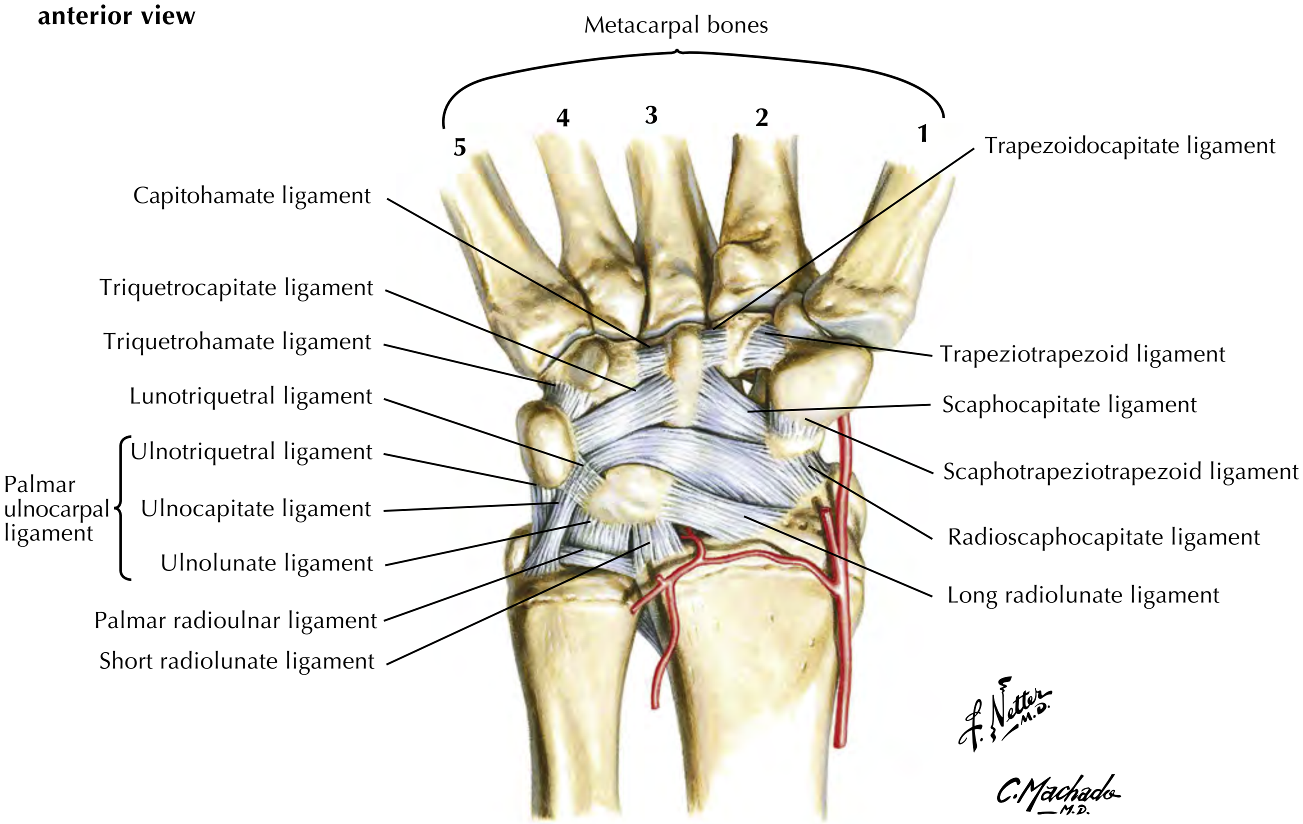
Ligaments of Wrist: Anterior View

See also **Plate 118**

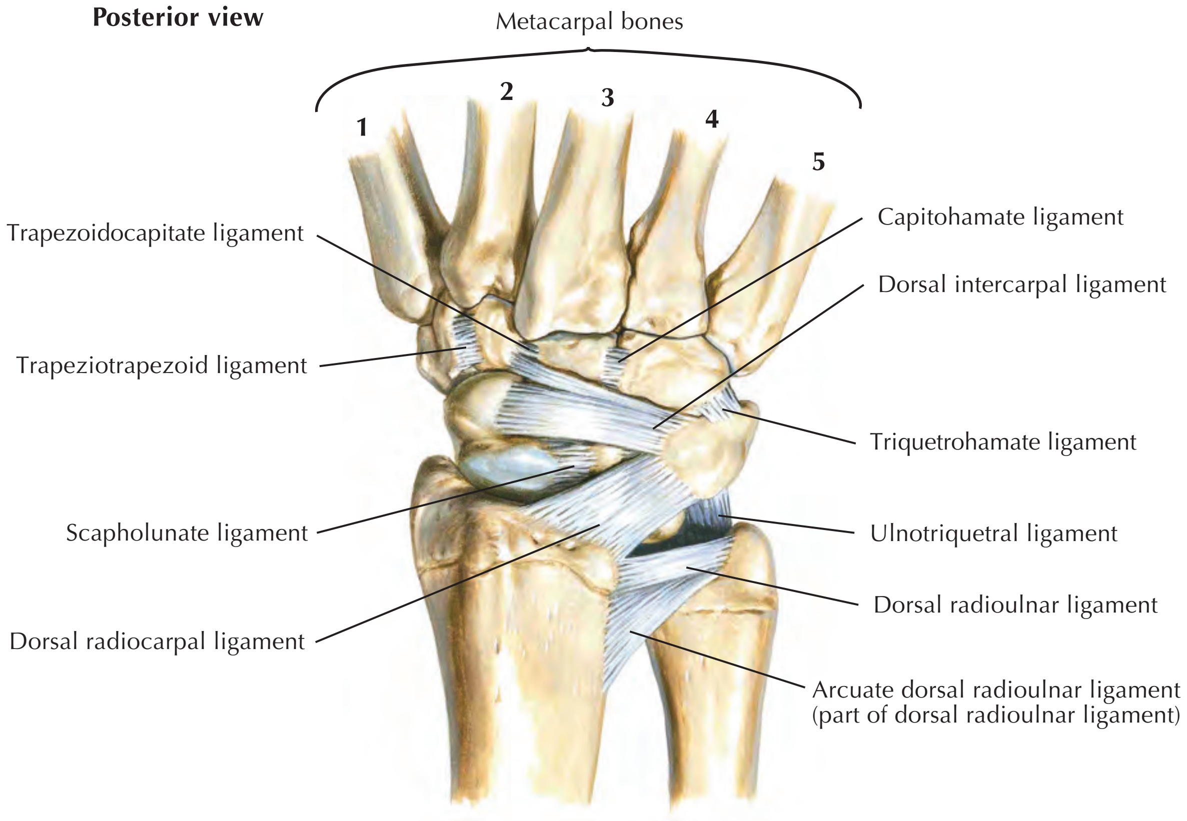
Deep palm

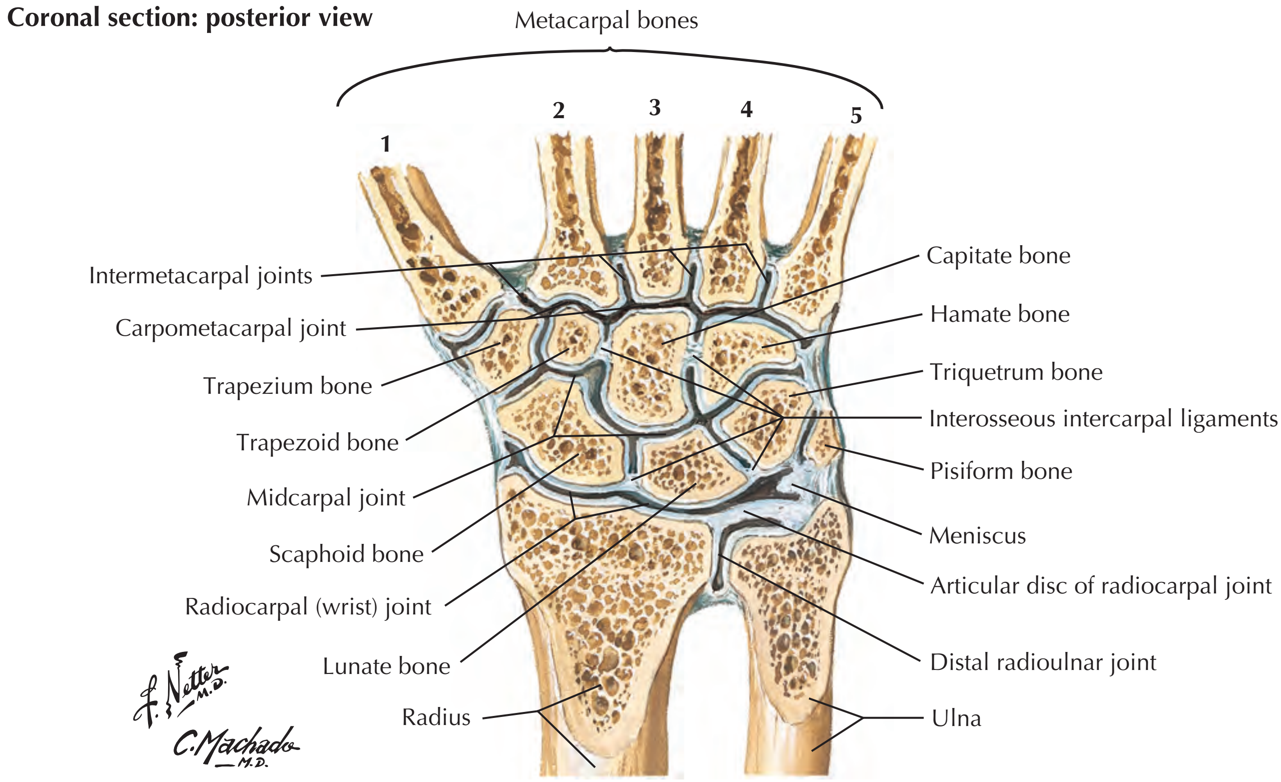

Metacarpal bones
5
4
3
2
1
Hook of hamate bone
Pisohamate ligament
Deep palmar branch of ulnar a.
Deep branch of ulnar n.
Pisometacarpal ligament
Pisiform bone
Flexor digitorum superficialis tendons
Flexor digitorum profundus tendons
Flexor carpi ulnaris tendon
Ulnar a. and n.
Interosseous membrane of forearm
Ulna
Flexor retinaculum of wrist
Tubercle of trapezium bone
Tubercle of scaphoid bone
Palmar aponeurosis
Median n.
Flexor pollicis longus tendon
Flexor carpi radialis tendon
Superficial palmar branch of radial a.
Radial a.
Palmar carpal ligament (*cut and reflected*)
Palmaris longus tendon
Radius

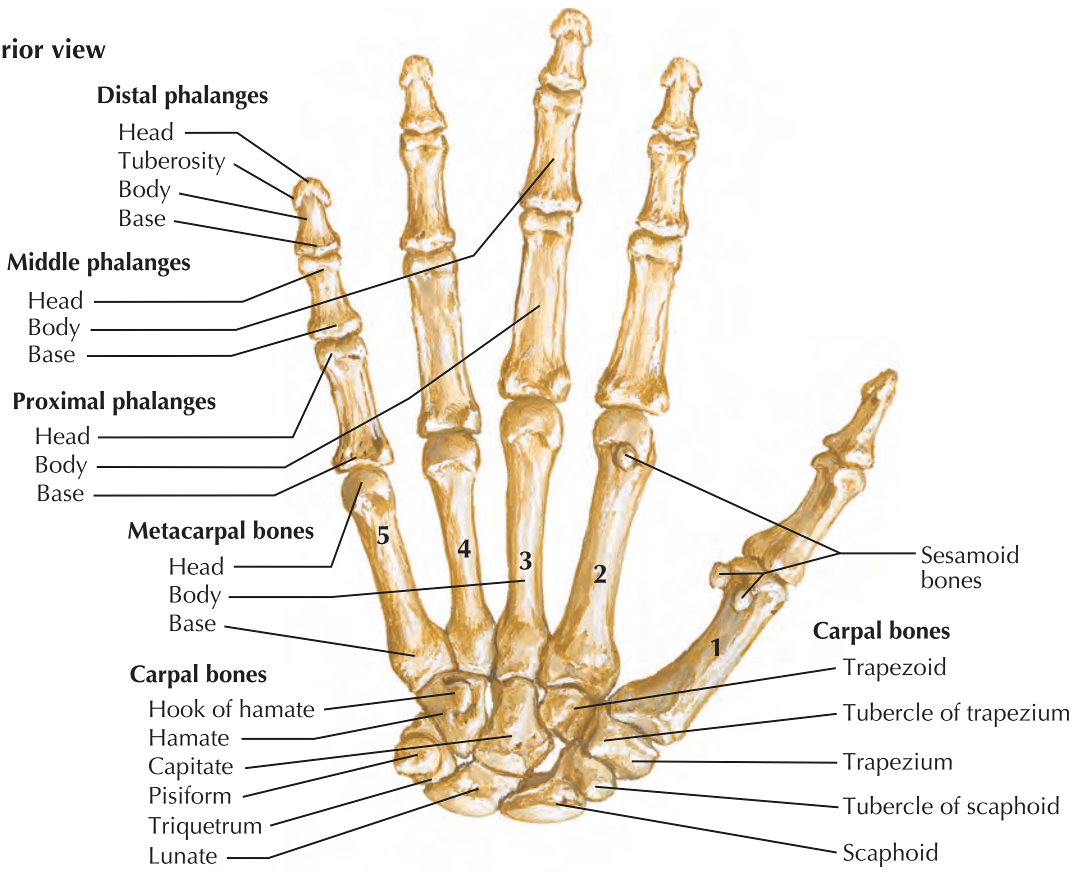
Flexor retinaculum of wrist removed: anterior view


Metacarpal bones
5
4
3
2
1
Capitohamate ligament
Triquetrocapitate ligament
Triquetrohamate ligament
Lunotriquetral ligament
Palmar ulnocarpal ligament
Ulnotriquetral ligament
Ulnocapitate ligament
Ulnolunate ligament
Palmar radioulnar ligament
Short radiolunate ligament
Trapezoidocapitate ligament
Trapeziotrapezoid ligament
Scaphocapitate ligament
Scaphotrapeziotrapezoid ligament
Radioscaphocapitate ligament
Long radiolunate ligament
F. Netter M.D.
C. Machado M.D.

See also **Plates 467, BP 98**

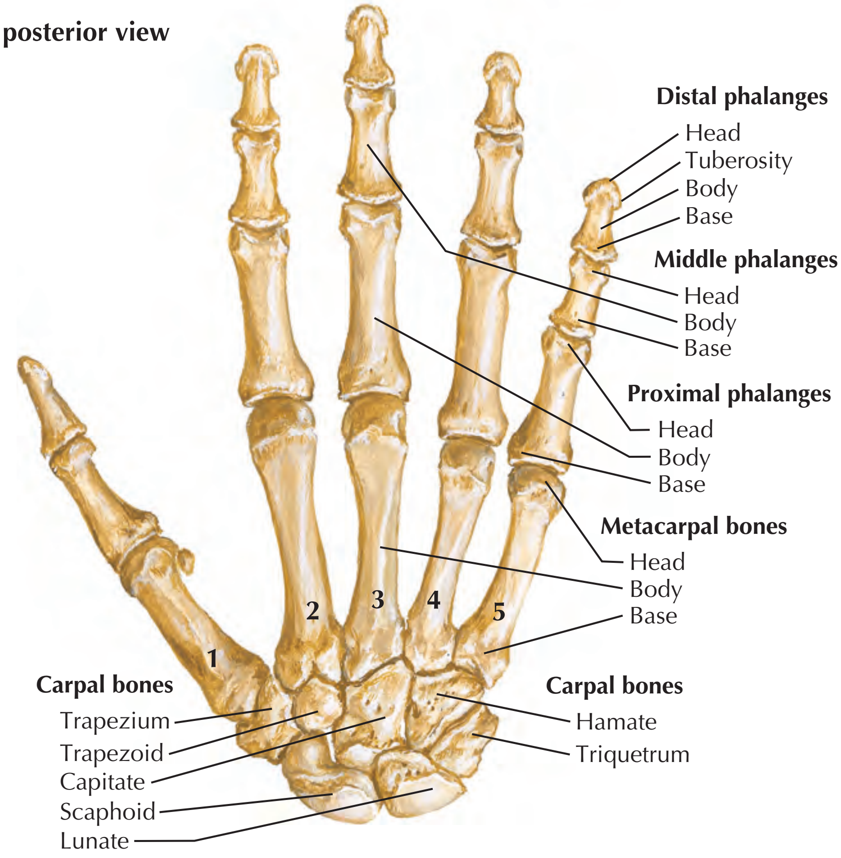

Posterior view
Metacarpal bones
1
2
3
4
5
Trapezoidocapitate ligament
Trapeziotrapezoid ligament
Scapholunate ligament
Dorsal radiocarpal ligament
Capitohamate ligament
Dorsal intercarpal ligament
Triquetrohamate ligament
Ulnotriquetral ligament
Dorsal radioulnar ligament
Arcuate dorsal radioulnar ligament
(part of dorsal radioulnar ligament)


Coronal section: posterior view
Metacarpal bones
1
2
3
4
5
Intermetacarpal joints
Carpometacarpal joint
Trapezium bone
Trapezoid bone
Midcarpal joint
Scaphoid bone
Radiocarpal (wrist) joint
Lunate bone
Radius
Capitate bone
Hamate bone
Triquetrum bone
Interosseous intercarpal ligaments
Pisiform bone
Meniscus
Articular disc of radiocarpal joint
Distal radioulnar joint
Ulna
F. Netter M.D.
C. Machado M.D.



Right hand: anterior view

Distal phalanges
Head
Tuberosity
Body
Base
Middle phalanges
Head
Body
Base
Proximal phalanges
Head
Body
Base
Metacarpal bones
Head
Body
Base
5
4
3
2
1
Sesamoid bones
Carpal bones
Hook of hamate
Hamate
Capitate
Pisiform
Triquetrum
Lunate
Carpal bones
Trapezoid
Tubercle of trapezium
Trapezium
Tubercle of scaphoid
Scaphoid



Right hand: posterior view

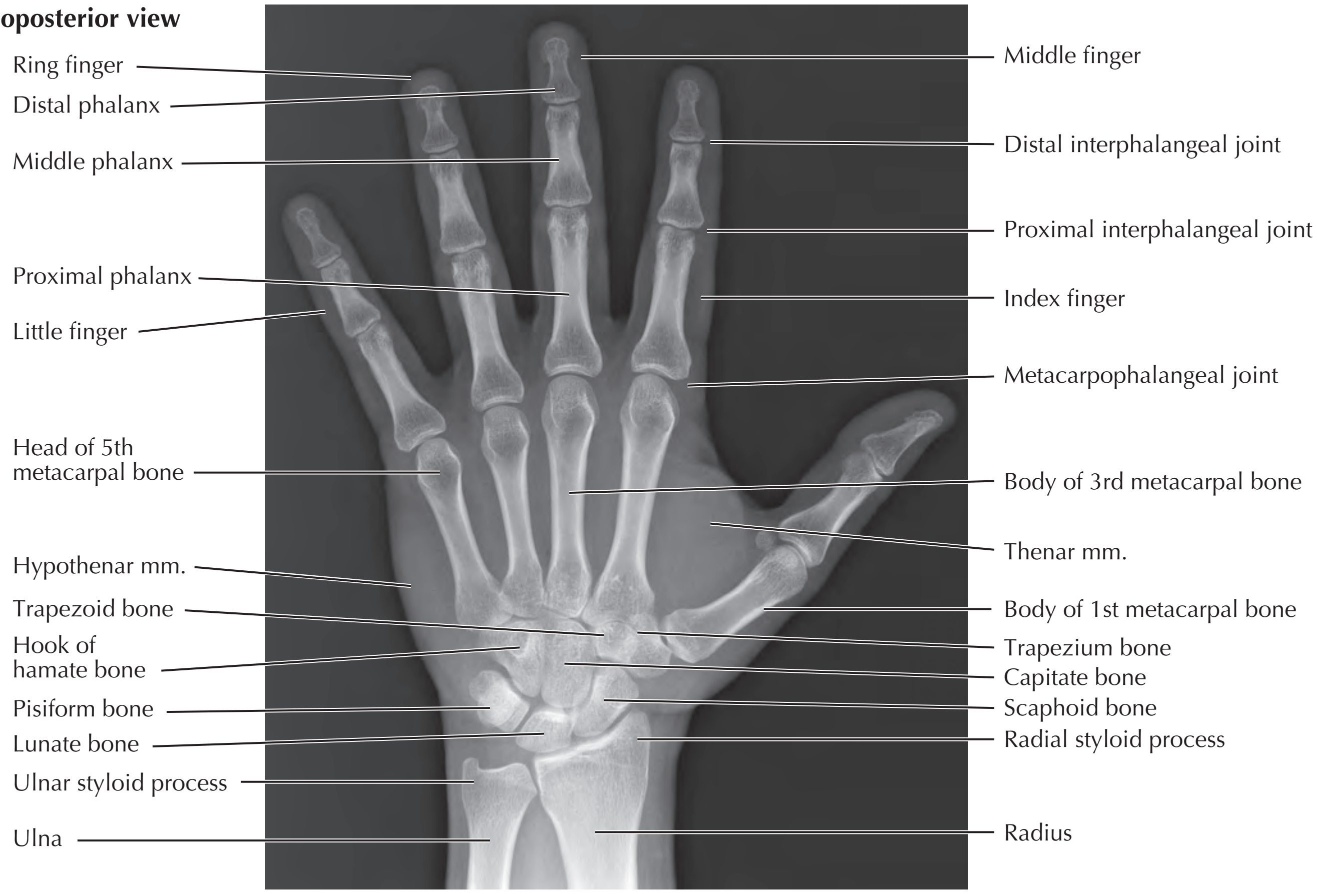
Distal phalanges
Head
Tuberosity
Body
Base
Middle phalanges
Head
Body
Base
Proximal phalanges
Head
Body
Base
Metacarpal bones
Head
Body
Base
1
2
3
4
5
Carpal bones
Trapezium
Trapezoid
Capitate
Scaphoid
Lunate
Carpal bones
Hamate
Triquetrum

F. Netter M.D.

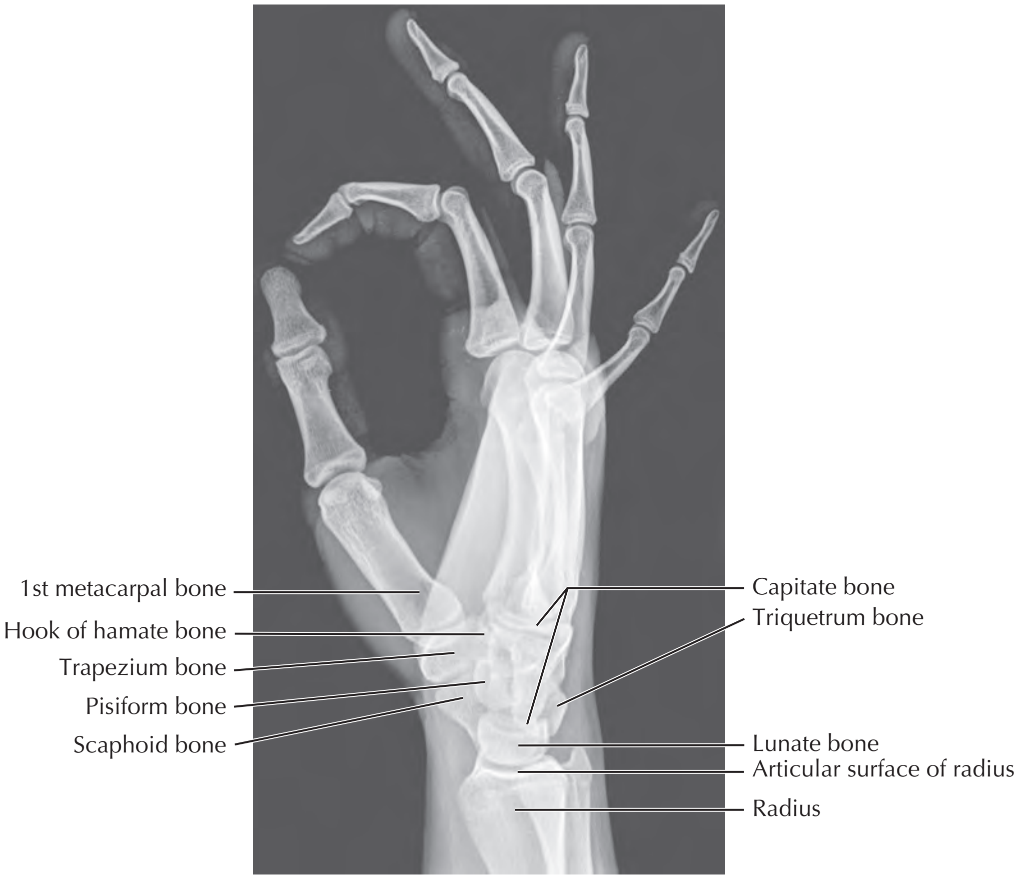
Wrist and Hand: Radiographs

See also **Plate 466**

Anteroposterior view

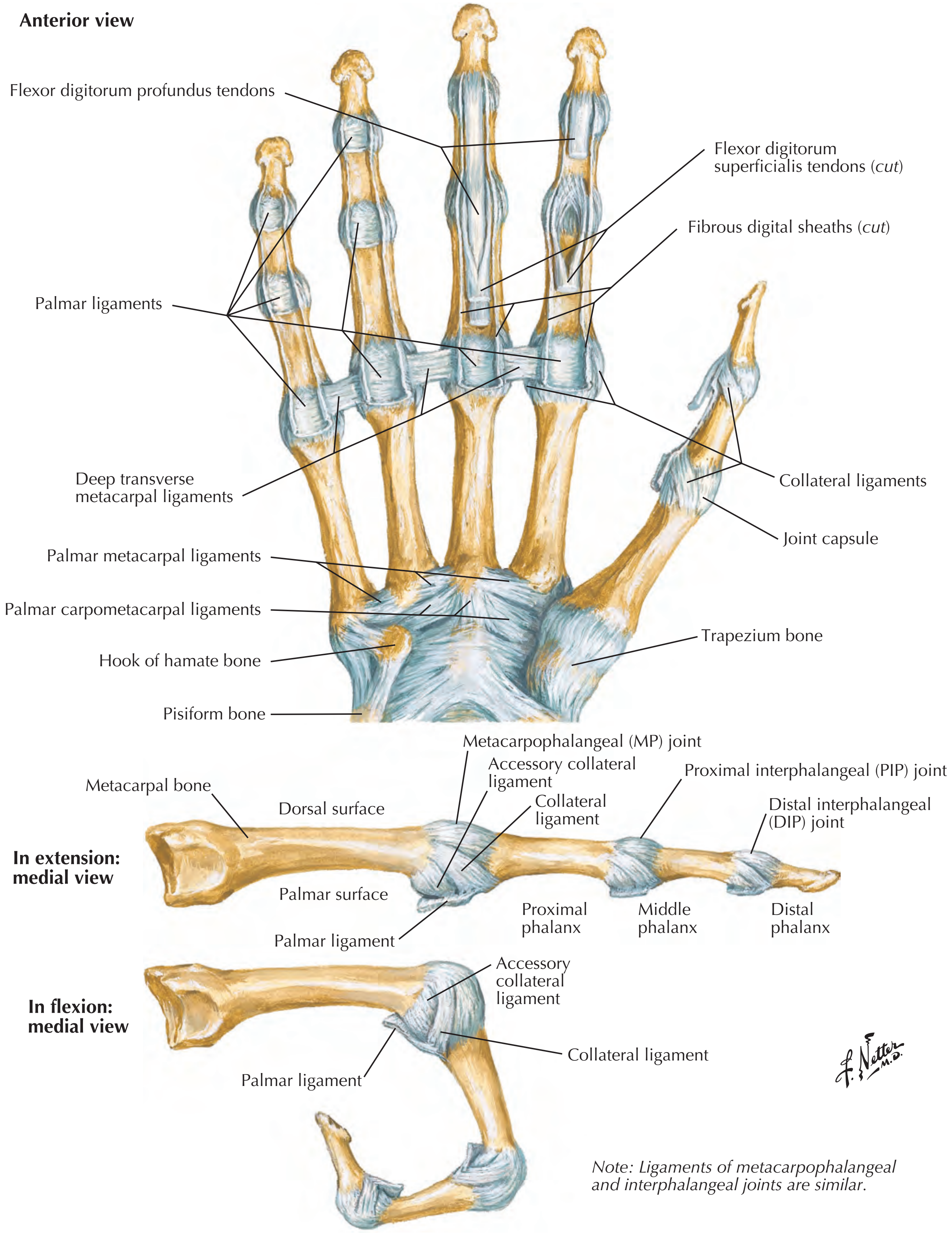

Ring finger
Distal phalanx
Middle phalanx
Proximal phalanx
Little finger
Head of 5th metacarpal bone
Hypothenar mm.
Trapezoid bone
Hook of hamate bone
Pisiform bone
Lunate bone
Ulnar styloid process
Ulna
Middle finger
Distal interphalangeal joint
Proximal interphalangeal joint
Index finger
Metacarpophalangeal joint
Body of 3rd metacarpal bone
Thenar mm.
Body of 1st metacarpal bone
Trapezium bone
Capitate bone
Scaphoid bone
Radial styloid process
Radius

Lateral view


1st metacarpal bone
Hook of hamate bone
Trapezium bone
Pisiform bone
Scaphoid bone
Capitate bone
Triquetrum bone
Lunate bone
Articular surface of radius
Radius

Metacarpophalangeal and Interphalangeal Ligaments

See also Plate 471

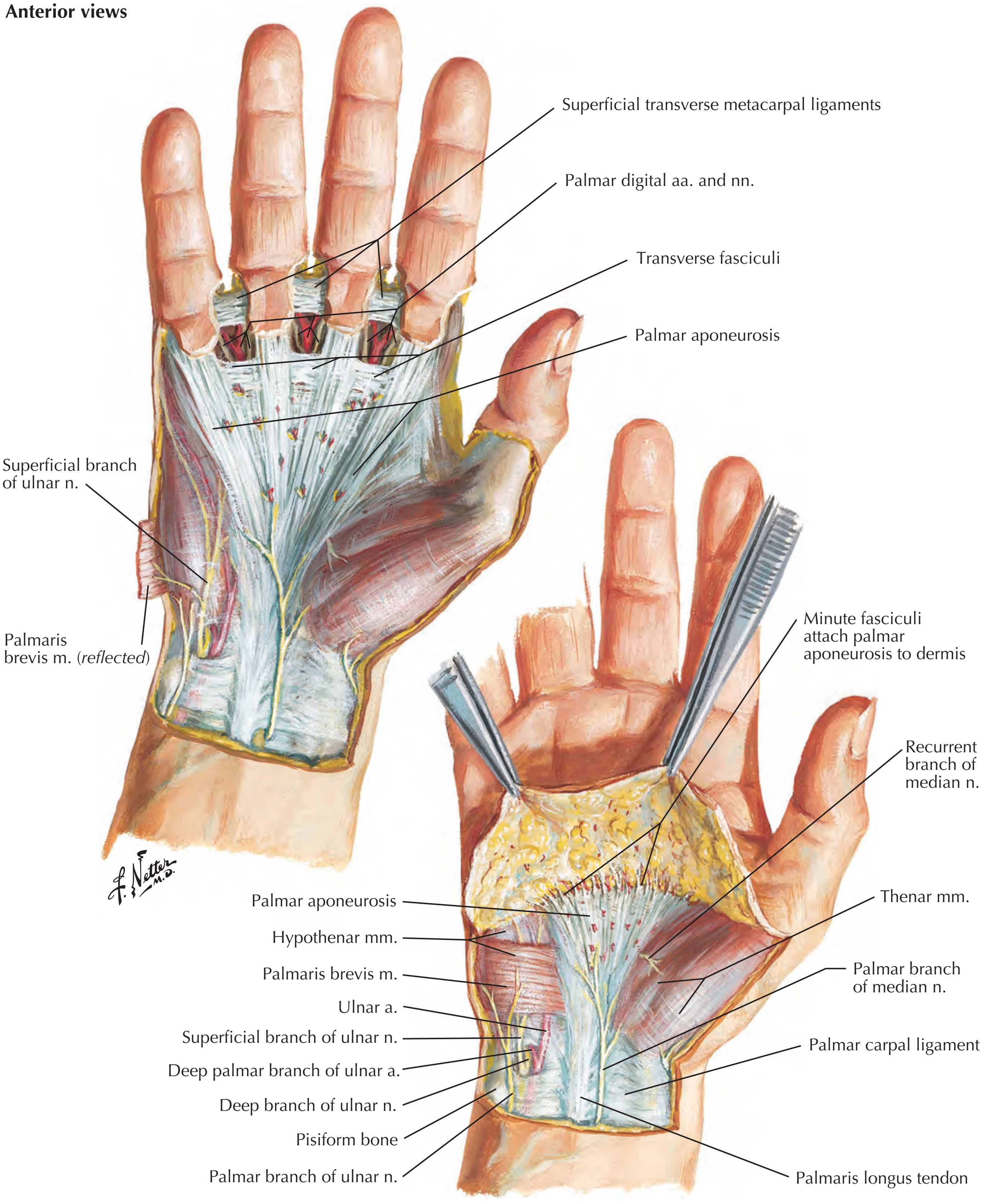

Anterior view
Flexor digitorum profundus tendons
Flexor digitorum superficialis tendons (cut)
Fibrous digital sheaths (cut)
Palmar ligaments
Collateral ligaments
Deep transverse metacarpal ligaments
Joint capsule
Palmar metacarpal ligaments
Palmar carpometacarpal ligaments
Trapezium bone
Hook of hamate bone
Pisiform bone
Metacarpophalangeal (MP) joint
Accessory collateral ligament
Proximal interphalangeal (PIP) joint
Metacarpal bone
Collateral ligament
Distal interphalangeal (DIP) joint
Dorsal surface
In extension: medial view
Palmar surface
Proximal phalanx
Middle phalanx
Distal phalanx
Palmar ligament
Accessory collateral ligament
In flexion: medial view
Collateral ligament
Palmar ligament
F. Netter M.D.

Note: Ligaments of metacarpophalangeal and interphalangeal joints are similar.

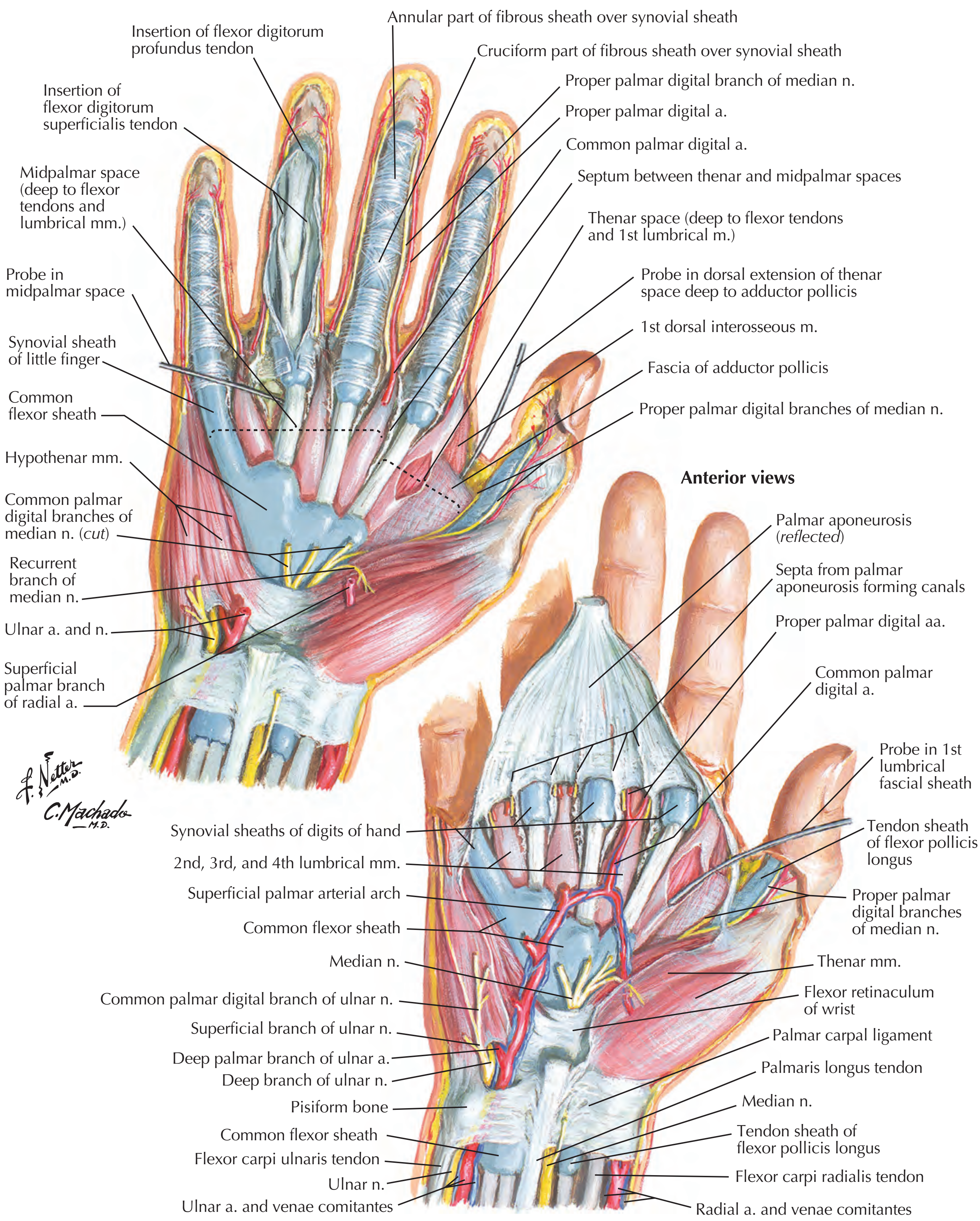
Wrist and Hand: Superficial Palmar Dissections

See also **Plate 482**

Anterior views

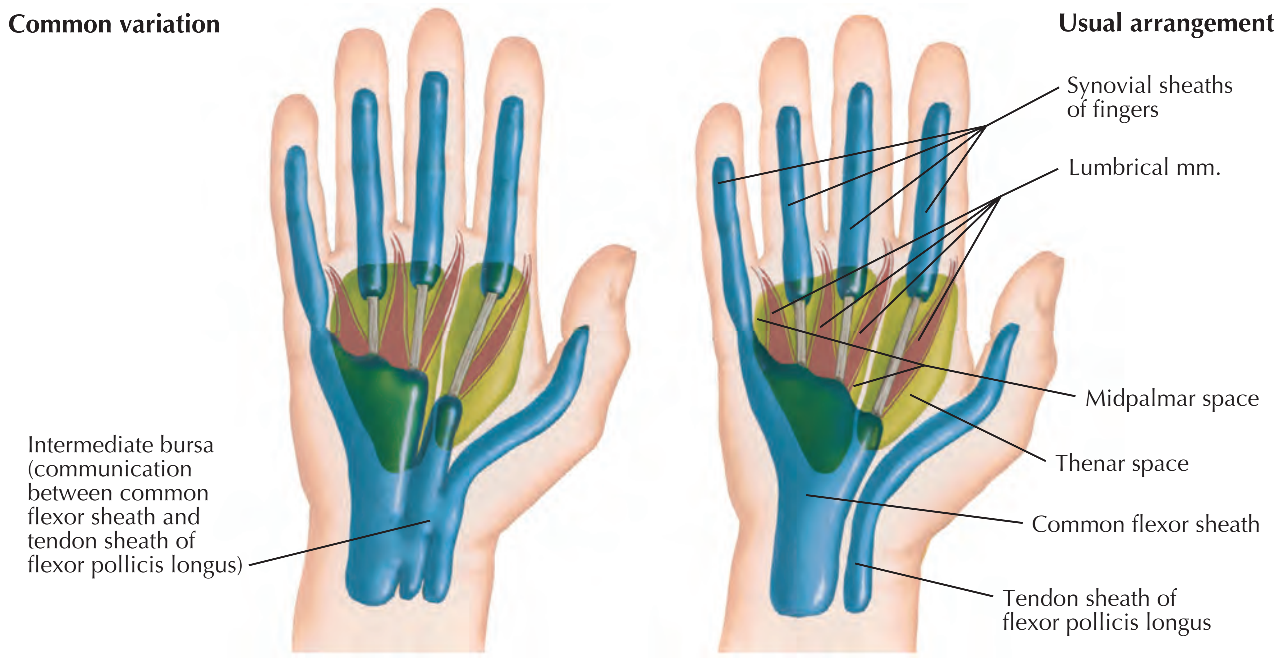


Superficial transverse metacarpal ligaments
Palmar digital aa. and nn.
Transverse fasciculi
Palmar aponeurosis
Superficial branch of ulnar n.
Palmaris brevis m. (*reflected*)
Minute fasciculi attach palmar aponeurosis to dermis
Recurrent branch of median n.
Palmar aponeurosis
Hypothenar mm.
Palmaris brevis m.
Ulnar a.
Superficial branch of ulnar n.
Deep palmar branch of ulnar a.
Deep branch of ulnar n.
Pisiform bone
Palmar branch of ulnar n.
Thenar mm.
Palmar branch of median n.
Palmar carpal ligament
Palmaris longus tendon


Insertion of flexor digitorum profundus tendon
Annular part of fibrous sheath over synovial sheath
Cruciform part of fibrous sheath over synovial sheath
Proper palmar digital branch of median n.
Proper palmar digital a.
Common palmar digital a.
Insertion of flexor digitorum superficialis tendon
Septum between thenar and midpalmar spaces
Midpalmar space (deep to flexor tendons and lumbrical mm.)
Thenar space (deep to flexor tendons and 1st lumbrical m.)
Probe in midpalmar space
Probe in dorsal extension of thenar space deep to adductor pollicis
1st dorsal interosseous m.
Synovial sheath of little finger
Fascia of adductor pollicis
Common flexor sheath
Proper palmar digital branches of median n.
Hypothenar mm.
Anterior views
Common palmar digital branches of median n. (*cut*)
Palmar aponeurosis (*reflected*)
Recurrent branch of median n.
Septa from palmar aponeurosis forming canals
Ulnar a. and n.
Proper palmar digital aa.
Superficial palmar branch of radial a.
Common palmar digital a.
Probe in 1st lumbrical fascial sheath
Synovial sheaths of digits of hand
Tendon sheath of flexor pollicis longus
2nd, 3rd, and 4th lumbrical mm.
Superficial palmar arterial arch
Proper palmar digital branches of median n.
Common flexor sheath
Median n.
Thenar mm.
Common palmar digital branch of ulnar n.
Flexor retinaculum of wrist
Superficial branch of ulnar n.
Palmar carpal ligament
Deep palmar branch of ulnar a.
Deep branch of ulnar n.
Palmaris longus tendon
Pisiform bone
Median n.
Common flexor sheath
Tendon sheath of flexor pollicis longus
Flexor carpi ulnaris tendon
Flexor carpi radialis tendon
Ulnar n.
Ulnar a. and venae comitantes
Radial a. and venae comitantes

Lumbrical Muscles, Midpalmar and Thenar Spaces, and Tendon Sheaths

See also **Plate 468**

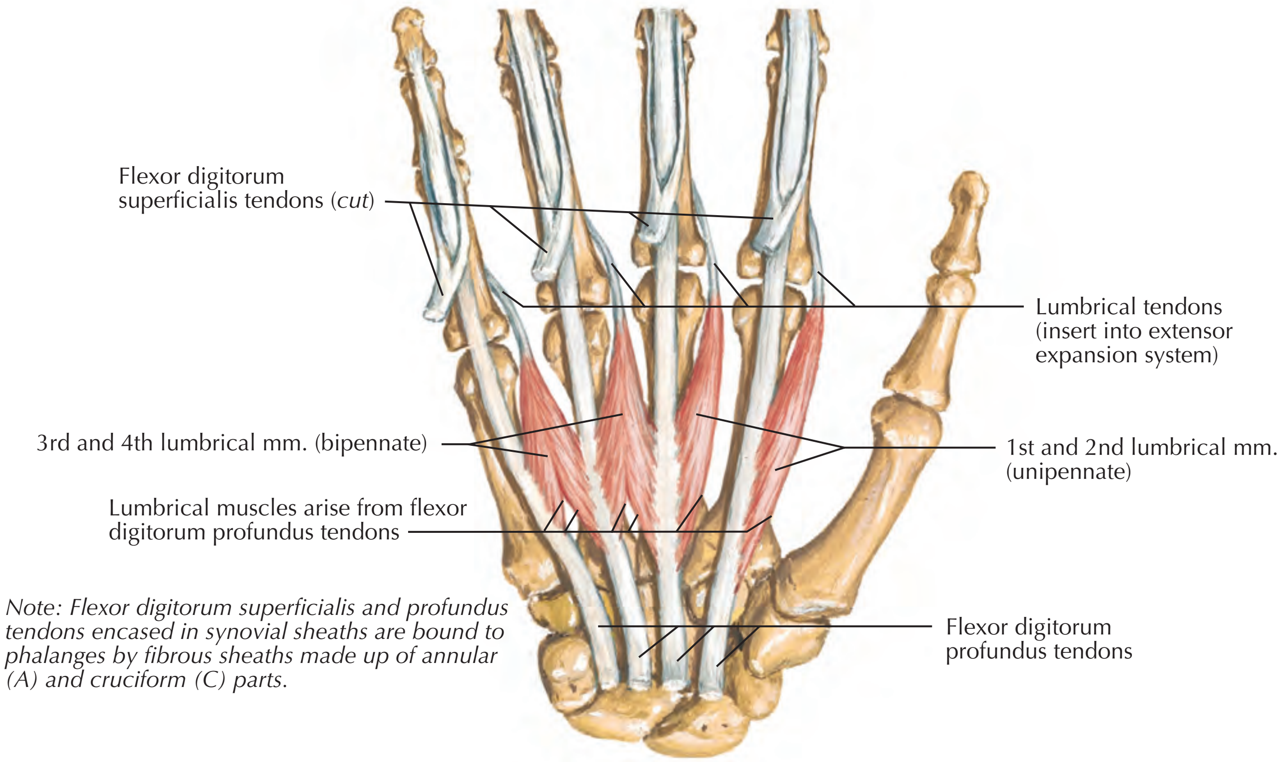


Common variation

Usual arrangement

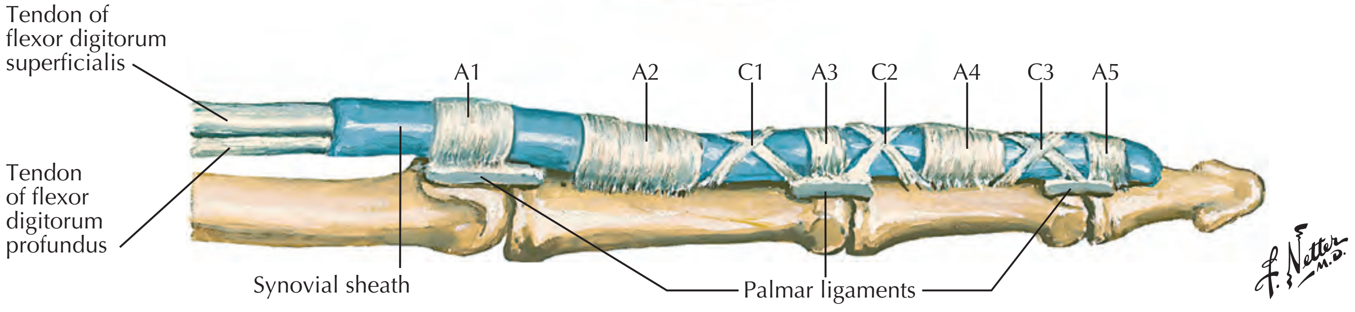
Synovial sheaths of fingers
Lumbrical mm.
Midpalmar space
Thenar space
Common flexor sheath
Tendon sheath of flexor pollicis longus
Intermediate bursa (communication between common flexor sheath and tendon sheath of flexor pollicis longus)

Lumbrical muscles: schema



Flexor digitorum superficialis tendons (*cut*)
Lumbrical tendons (insert into extensor expansion system)
3rd and 4th lumbrical mm. (bipennate)
1st and 2nd lumbrical mm. (unipennate)
Lumbrical muscles arise from flexor digitorum profundus tendons
Flexor digitorum profundus tendons

Note: Flexor digitorum superficialis and profundus tendons encased in synovial sheaths are bound to phalanges by fibrous sheaths made up of annular (A) and cruciform (C) parts.

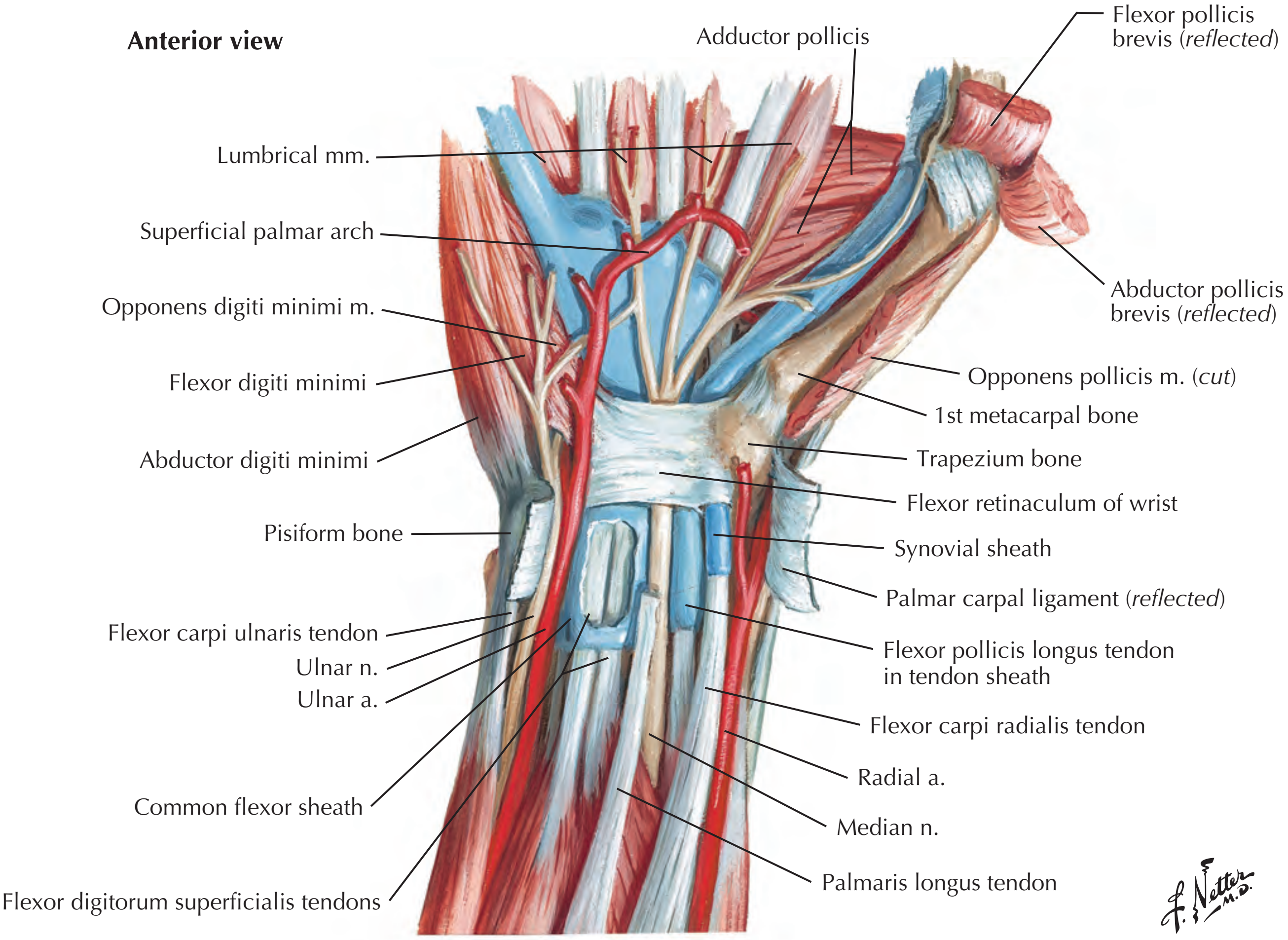


Tendon of flexor digitorum superficialis
Tendon of flexor digitorum profundus
Synovial sheath
A1
A2
C1
A3
C2
A4
C3
A5
Palmar ligaments

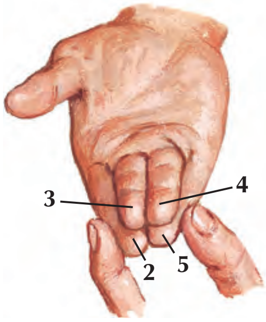
Flexor Tendons, Arteries, and Nerves at Wrist

See also **Plates 482, 483, BP 100**

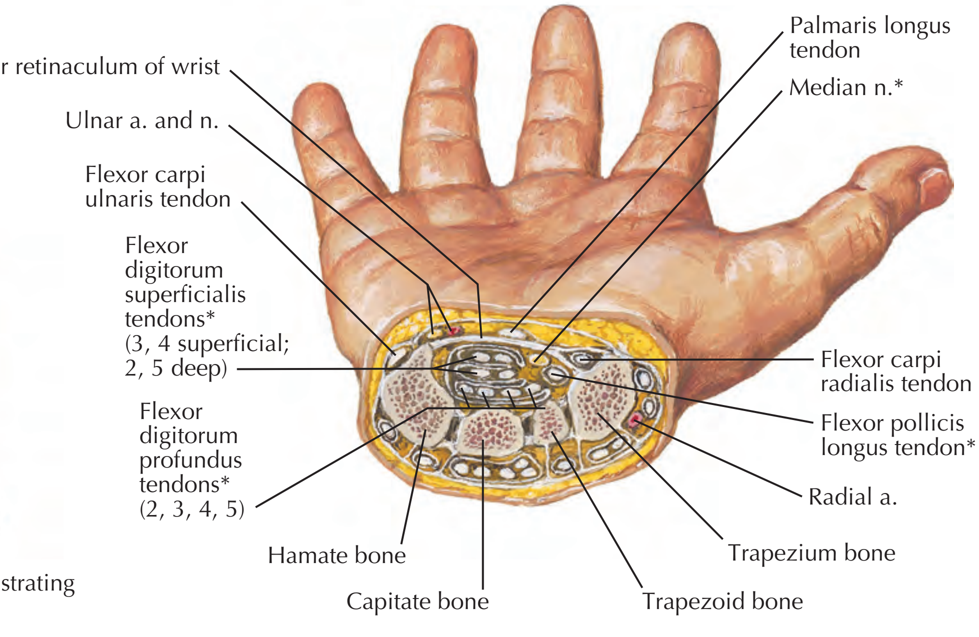
Anterior view


Adductor pollicis
Flexor pollicis brevis (*reflected*)
Lumbrical mm.
Superficial palmar arch
Opponens digiti minimi m.
Abductor pollicis brevis (*reflected*)
Flexor digiti minimi
Opponens pollicis m. (*cut*)
1st metacarpal bone
Abductor digiti minimi
Trapezium bone
Flexor retinaculum of wrist
Pisiform bone
Synovial sheath
Palmar carpal ligament (*reflected*)
Flexor carpi ulnaris tendon
Ulnar n.
Ulnar a.
Flexor pollicis longus tendon in tendon sheath
Flexor carpi radialis tendon
Radial a.
Common flexor sheath
Median n.
Palmaris longus tendon
Flexor digitorum superficialis tendons
F. Netter M.D.

Cross section of wrist demonstrating carpal tunnel



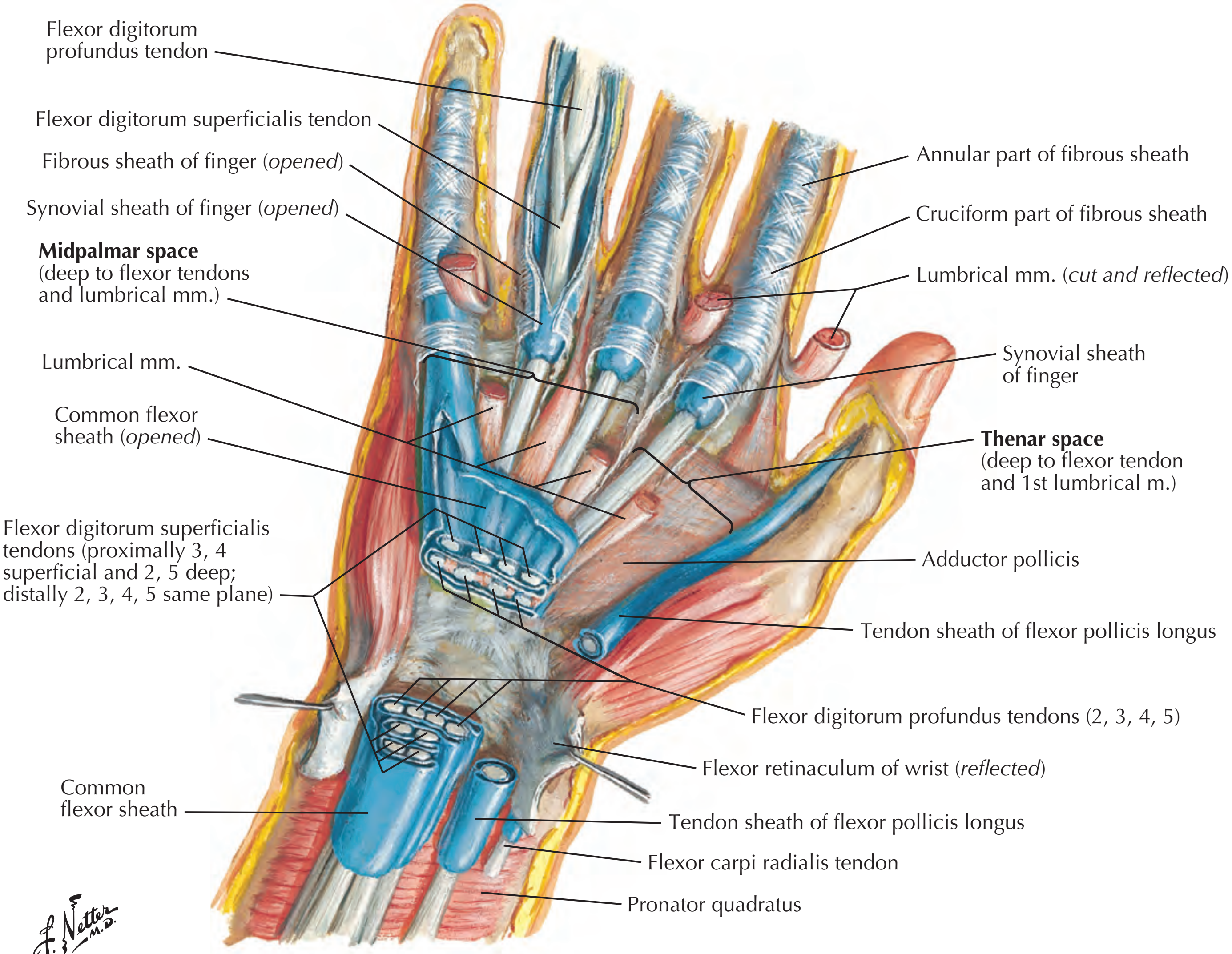
Simple method of demonstrating arrangement of flexor digitorum superficialis tendons within carpal tunnel

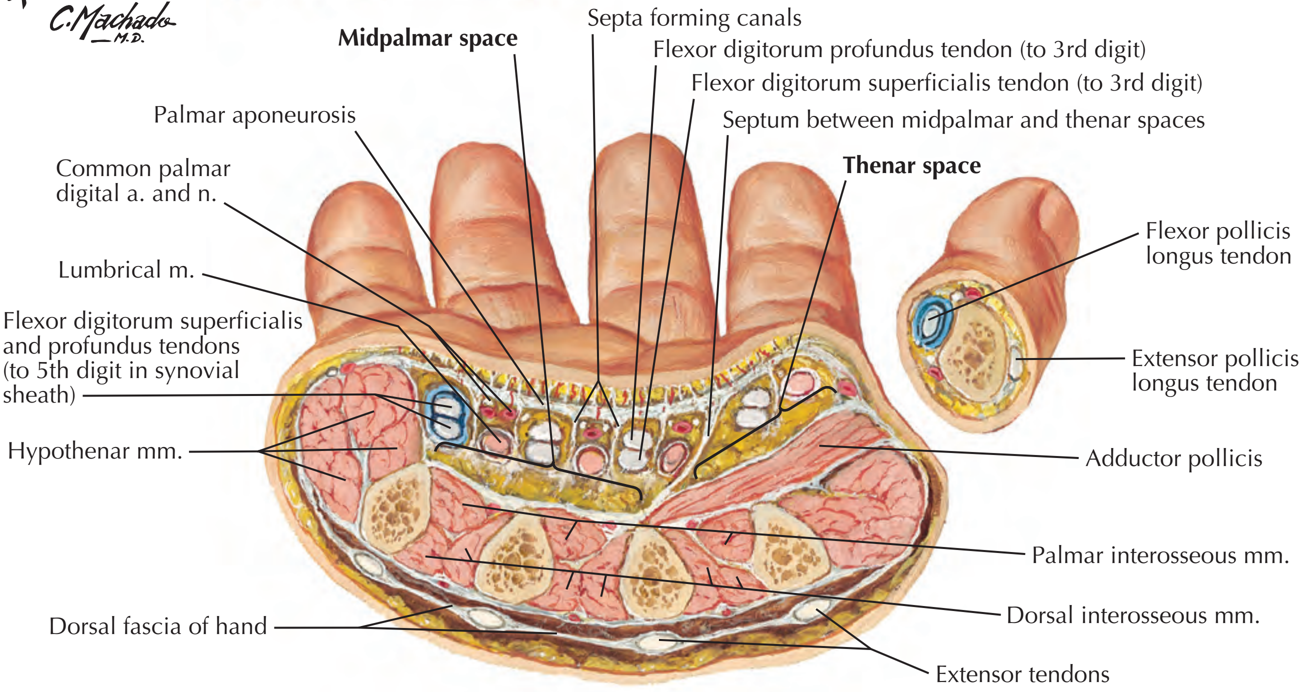

Flexor retinaculum of wrist
Palmaris longus tendon
Median n.*
Ulnar a. and n.
Flexor carpi ulnaris tendon
Flexor digitorum superficialis tendons* (3, 4 superficial; 2, 5 deep)
Flexor carpi radialis tendon
Flexor pollicis longus tendon*
Flexor digitorum profundus tendons* (2, 3, 4, 5)
Radial a.
Hamate bone
Trapezium bone
Capitate bone
Trapezoid bone

*Contents of carpal tunnel

Spaces and Tendon Sheaths of Hand

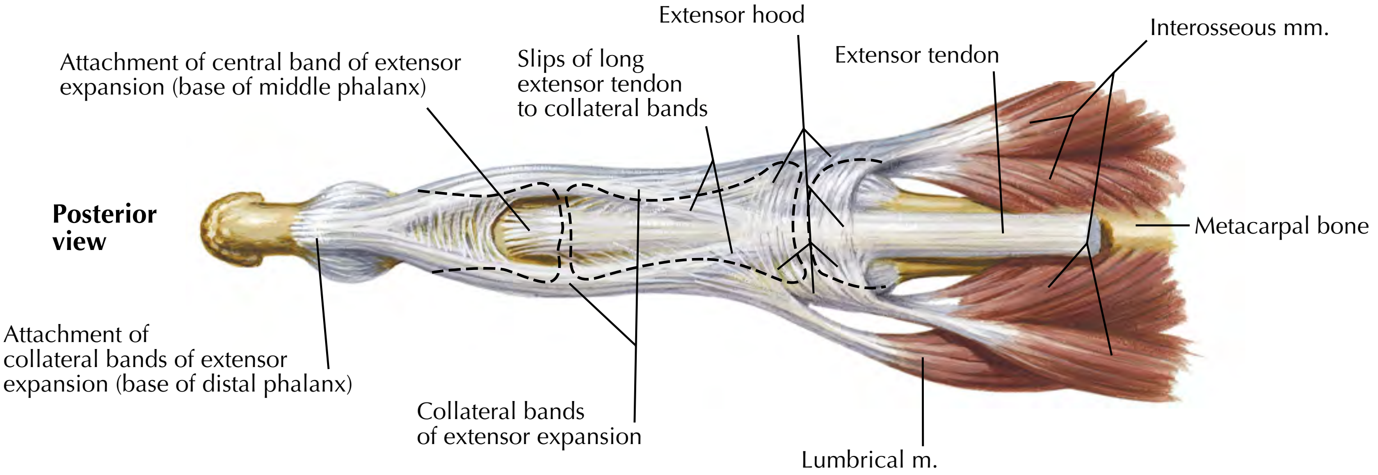
See also **Plate BP 100**

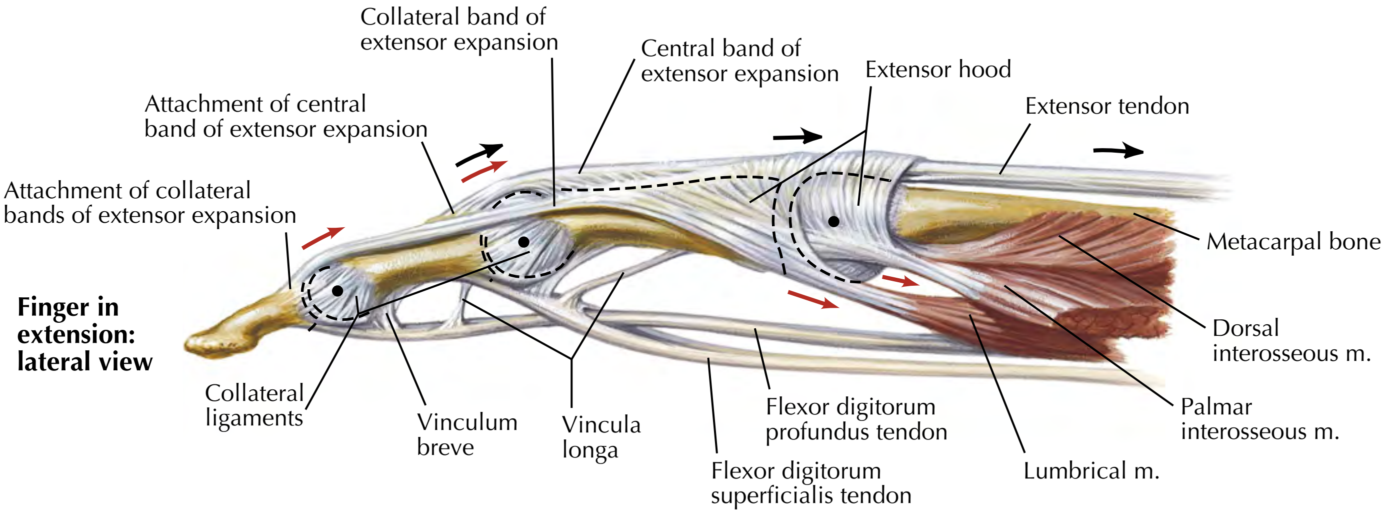

Flexor digitorum profundus tendon
Flexor digitorum superficialis tendon
Fibrous sheath of finger (*opened*)
Synovial sheath of finger (*opened*)
Midpalmar space (deep to flexor tendons and lumbrical mm.)
Lumbrical mm.
Common flexor sheath (*opened*)
Flexor digitorum superficialis tendons (proximally 3, 4 superficial and 2, 5 deep; distally 2, 3, 4, 5 same plane)
Common flexor sheath
Annular part of fibrous sheath
Cruciform part of fibrous sheath
Lumbrical mm. (*cut and reflected*)
Synovial sheath of finger
Thenar space (deep to flexor tendon and 1st lumbrical m.)
Adductor pollicis
Tendon sheath of flexor pollicis longus
Flexor digitorum profundus tendons (2, 3, 4, 5)
Flexor retinaculum of wrist (*reflected*)
Tendon sheath of flexor pollicis longus
Flexor carpi radialis tendon
Pronator quadratus
F. Netter M.D.
C. Machado M.D.

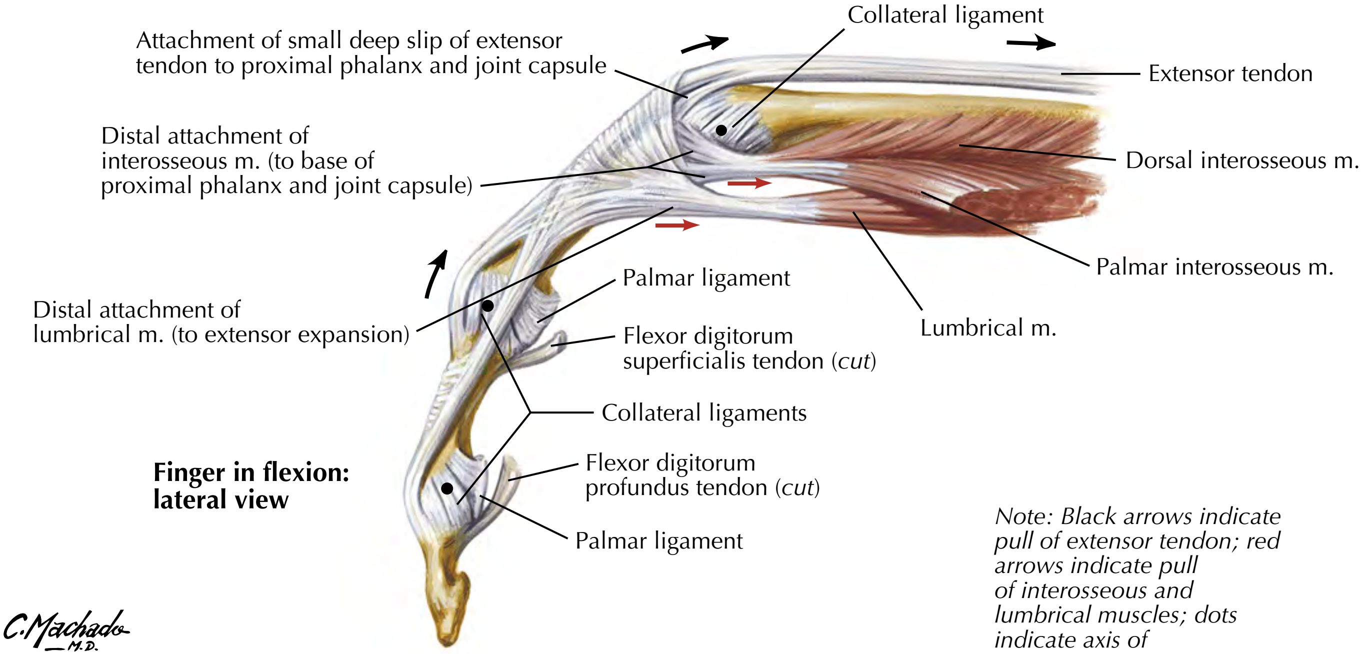

Midpalmar space
Septa forming canals
Flexor digitorum profundus tendon (to 3rd digit)
Flexor digitorum superficialis tendon (to 3rd digit)
Septum between midpalmar and thenar spaces
Thenar space
Palmar aponeurosis
Common palmar digital a. and n.
Lumbrical m.
Flexor digitorum superficialis and profundus tendons (to 5th digit in synovial sheath)
Hypothenar mm.
Dorsal fascia of hand
Flexor pollicis longus tendon
Extensor pollicis longus tendon
Adductor pollicis
Palmar interosseous mm.
Dorsal interosseous mm.
Extensor tendons

Flexor and Extensor Tendons in Fingers

See also Plate 475


Posterior view
Extensor hood
Attachment of central band of extensor expansion (base of middle phalanx)
Slips of long extensor tendon to collateral bands
Extensor tendon
Interosseous mm.
Metacarpal bone
Attachment of collateral bands of extensor expansion (base of distal phalanx)
Collateral bands of extensor expansion
Lumbrical m.


Finger in extension: lateral view
Collateral band of extensor expansion
Central band of extensor expansion
Extensor hood
Attachment of central band of extensor expansion
Extensor tendon
Attachment of collateral bands of extensor expansion
Metacarpal bone
Dorsal interosseous m.
Palmar interosseous m.
Collateral ligaments
Vinculum breve
Vincula longa
Flexor digitorum profundus tendon
Flexor digitorum superficialis tendon
Lumbrical m.

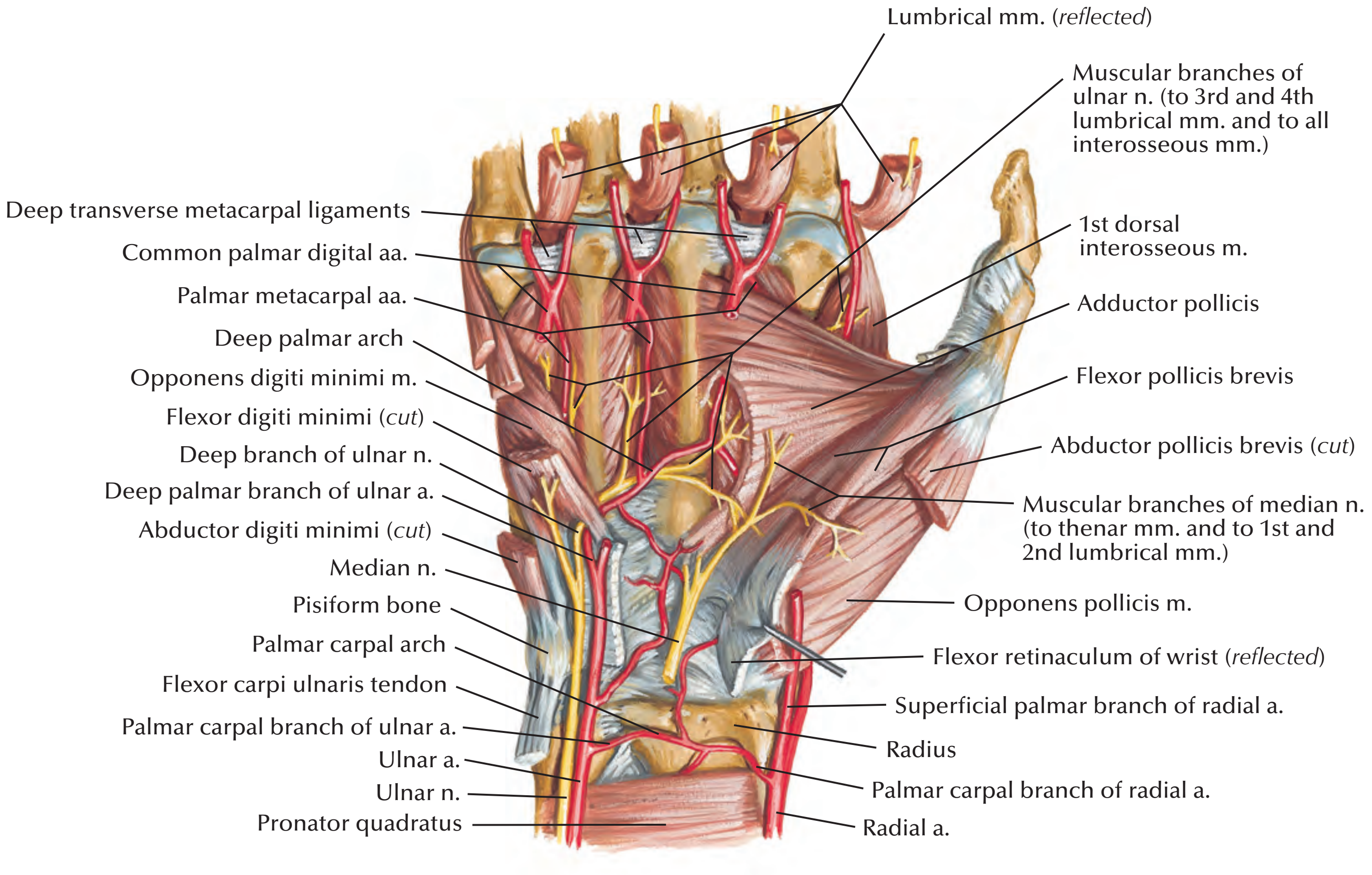

Finger in flexion: lateral view
Collateral ligament
Attachment of small deep slip of extensor tendon to proximal phalanx and joint capsule
Extensor tendon
Distal attachment of interosseous m. (to base of proximal phalanx and joint capsule)
Dorsal interosseous m.
Palmar interosseous m.
Palmar ligament
Distal attachment of lumbrical m. (to extensor expansion)
Flexor digitorum superficialis tendon (cut)
Lumbrical m.
Collateral ligaments
Flexor digitorum profundus tendon (cut)
Palmar ligament

Note: Black arrows indicate pull of extensor tendon; red arrows indicate pull of interosseous and lumbrical muscles; dots indicate axis of rotation of joints.

C. Machado M.D.

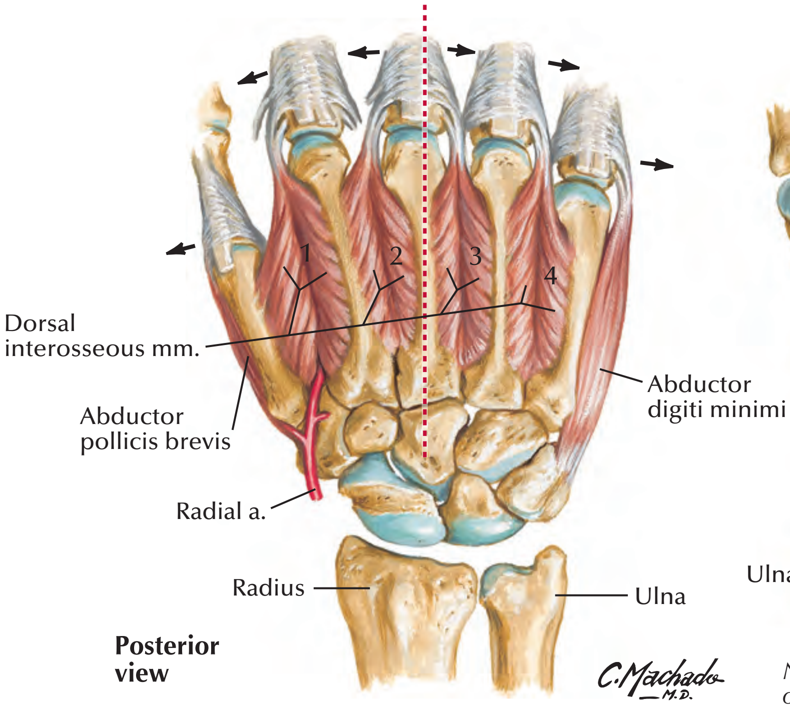
Muscles of Hand

See also **Plate BP 101**



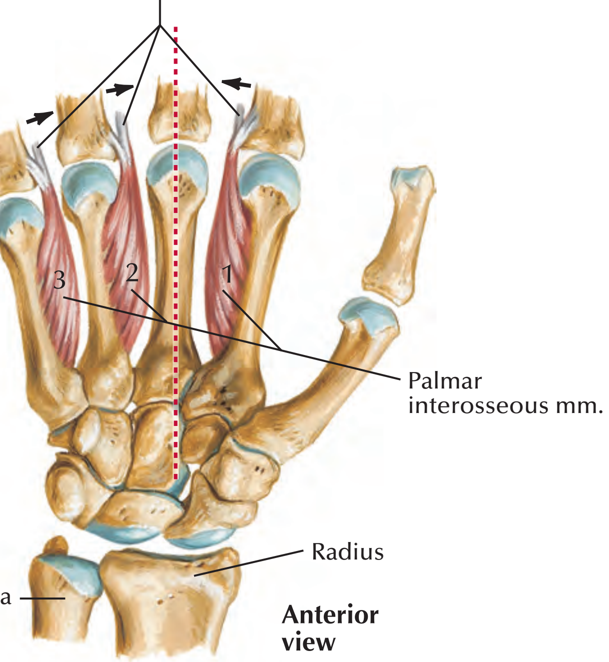
Lumbrical mm. (*reflected*)
Muscular branches of ulnar n. (to 3rd and 4th lumbrical mm. and to all interosseous mm.)
Deep transverse metacarpal ligaments
Common palmar digital aa.
Palmar metacarpal aa.
Deep palmar arch
Opponens digiti minimi m.
Flexor digiti minimi (*cut*)
Deep branch of ulnar n.
Deep palmar branch of ulnar a.
Abductor digiti minimi (*cut*)
Median n.
Pisiform bone
Palmar carpal arch
Flexor carpi ulnaris tendon
Palmar carpal branch of ulnar a.
Ulnar a.
Ulnar n.
Pronator quadratus
1st dorsal interosseous m.
Adductor pollicis
Flexor pollicis brevis
Abductor pollicis brevis (*cut*)
Muscular branches of median n. (to thenar mm. and to 1st and 2nd lumbrical mm.)
Opponens pollicis m.
Flexor retinaculum of wrist (*reflected*)
Superficial palmar branch of radial a.
Radius
Palmar carpal branch of radial a.
Radial a.

Anterior view



1
2
3
4
Dorsal interosseous mm.
Abductor pollicis brevis
Abductor digiti minimi
Radial a.
Radius
Ulna

Posterior view



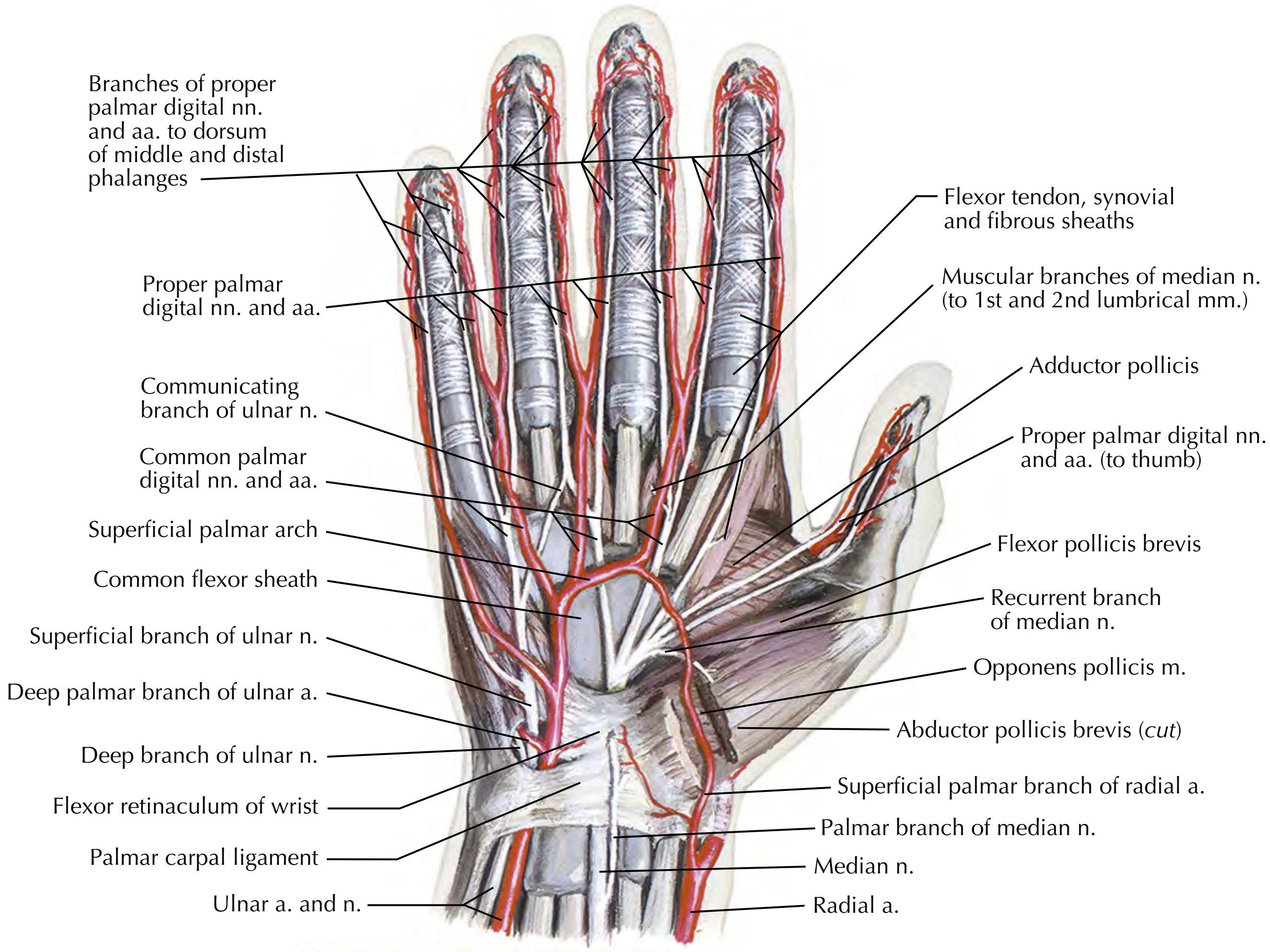
Tendinous slips to extensor expansions
3
2
1
Palmar interosseous mm.
Radius
Ulna

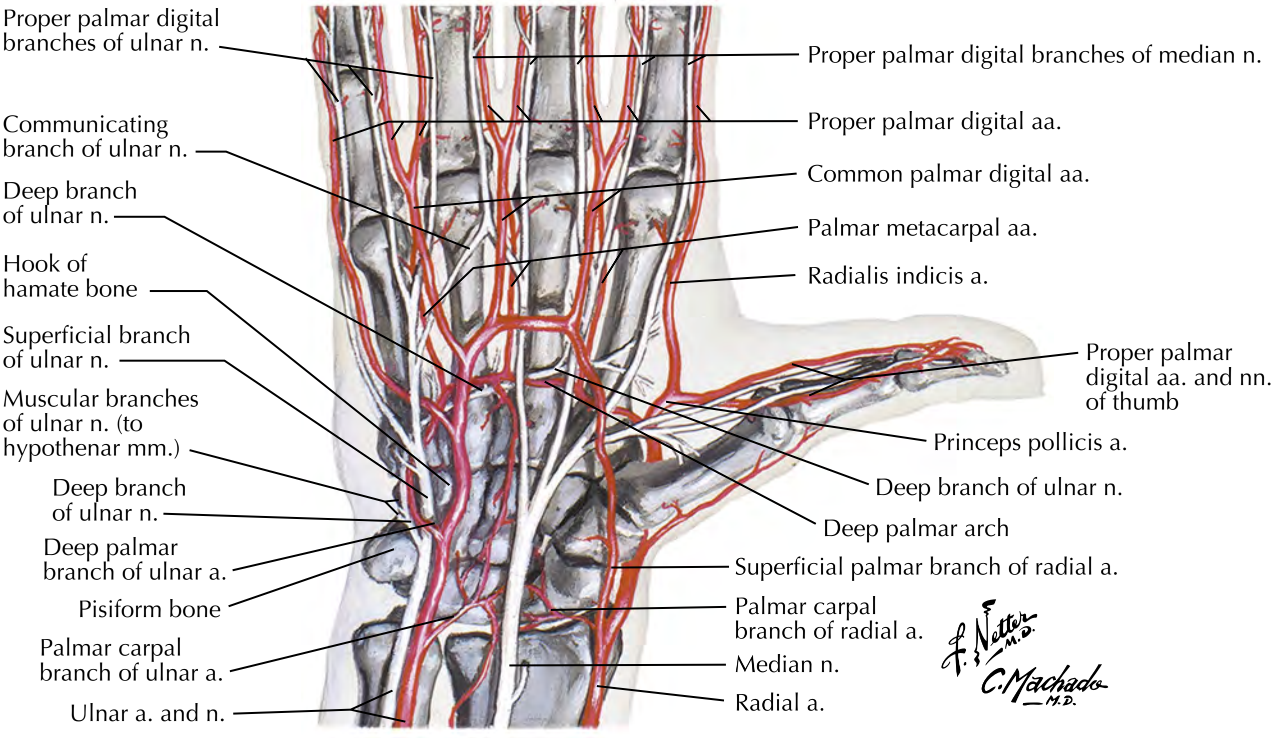
Anterior view

Note: Arrows indicate action of muscles. Dashed line on third digit is the plane of reference for adduction and abduction of the digits.

Arteries of Hand: Palmar Views

See also **Plate 443**


Branches of proper palmar digital nn. and aa. to dorsum of middle and distal phalanges
Proper palmar digital nn. and aa.
Communicating branch of ulnar n.
Common palmar digital nn. and aa.
Superficial palmar arch
Common flexor sheath
Superficial branch of ulnar n.
Deep palmar branch of ulnar a.
Deep branch of ulnar n.
Flexor retinaculum of wrist
Palmar carpal ligament
Ulnar a. and n.
Flexor tendon, synovial and fibrous sheaths
Muscular branches of median n. (to 1st and 2nd lumbrical mm.)
Adductor pollicis
Proper palmar digital nn. and aa. (to thumb)
Flexor pollicis brevis
Recurrent branch of median n.
Opponens pollicis m.
Abductor pollicis brevis (*cut*)
Superficial palmar branch of radial a.
Palmar branch of median n.
Median n.
Radial a.


Proper palmar digital branches of ulnar n.
Communicating branch of ulnar n.
Deep branch of ulnar n.
Hook of hamate bone
Superficial branch of ulnar n.
Muscular branches of ulnar n. (to hypothenar mm.)
Deep branch of ulnar n.
Deep palmar branch of ulnar a.
Pisiform bone
Palmar carpal branch of ulnar a.
Ulnar a. and n.
Proper palmar digital branches of median n.
Proper palmar digital aa.
Common palmar digital aa.
Palmar metacarpal aa.
Radialis indicis a.
Proper palmar digital aa. and nn. of thumb
Princeps pollicis a.
Deep branch of ulnar n.
Deep palmar arch
Superficial palmar branch of radial a.
Palmar carpal branch of radial a.
Median n.
Radial a.

F. Netter M.D.
C. Machado M.D.

Wrist and Hand: Superficial Lateral Dissection

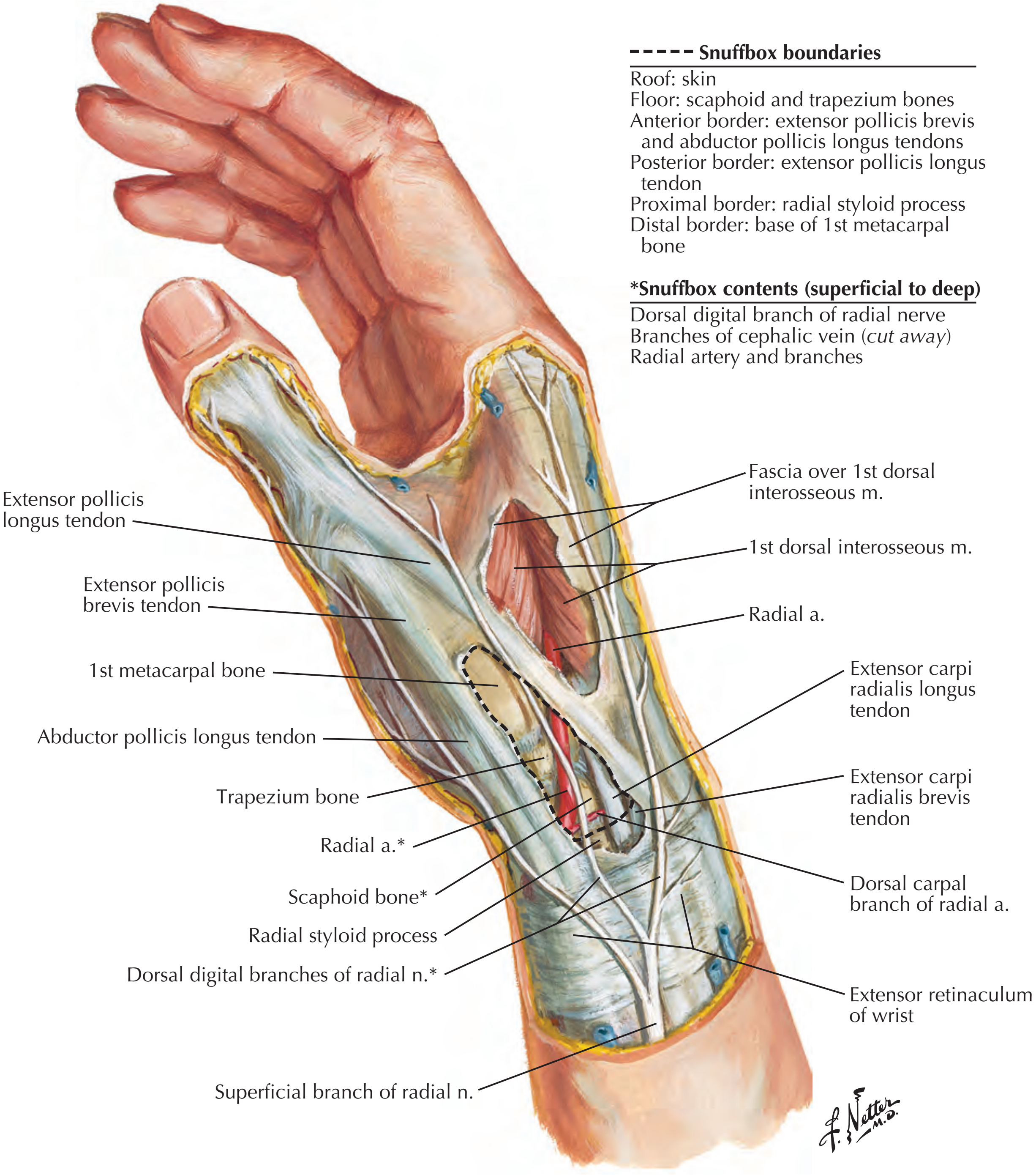
See also **Plate 489**

----- Snuffbox boundaries

Roof: skin
Floor: scaphoid and trapezium bones
Anterior border: extensor pollicis brevis and abductor pollicis longus tendons
Posterior border: extensor pollicis longus tendon
Proximal border: radial styloid process
Distal border: base of 1st metacarpal bone

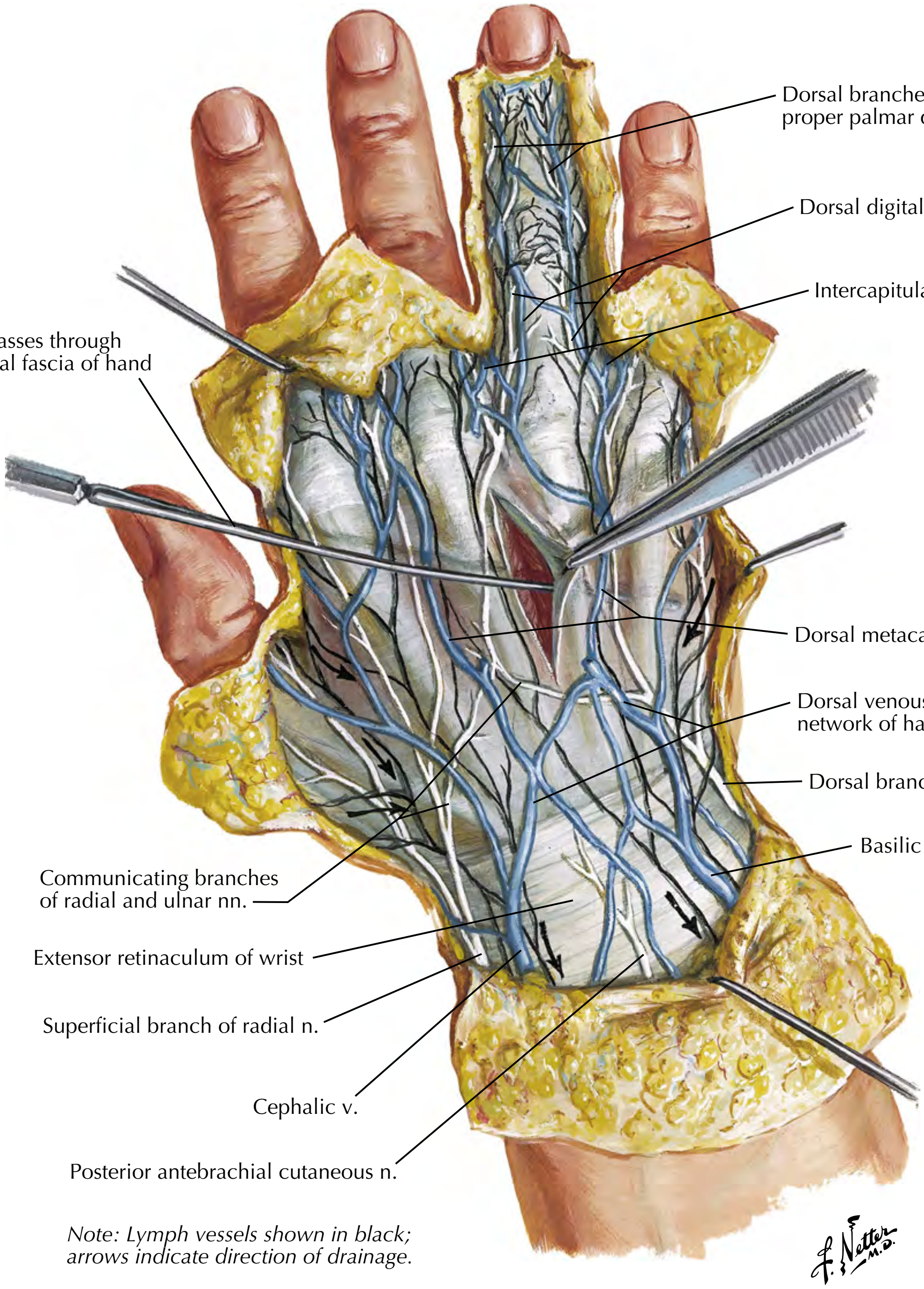
***Snuffbox contents (superficial to deep)**

Dorsal digital branch of radial nerve
Branches of cephalic vein (*cut away*)
Radial artery and branches


Extensor pollicis longus tendon
Extensor pollicis brevis tendon
1st metacarpal bone
Abductor pollicis longus tendon
Trapezium bone
Radial a.*
Scaphoid bone*
Radial styloid process
Dorsal digital branches of radial n.*
Superficial branch of radial n.
Fascia over 1st dorsal interosseous m.
1st dorsal interosseous m.
Radial a.
Extensor carpi radialis longus tendon
Extensor carpi radialis brevis tendon
Dorsal carpal branch of radial a.
Extensor retinaculum of wrist
F. Netter M.D.

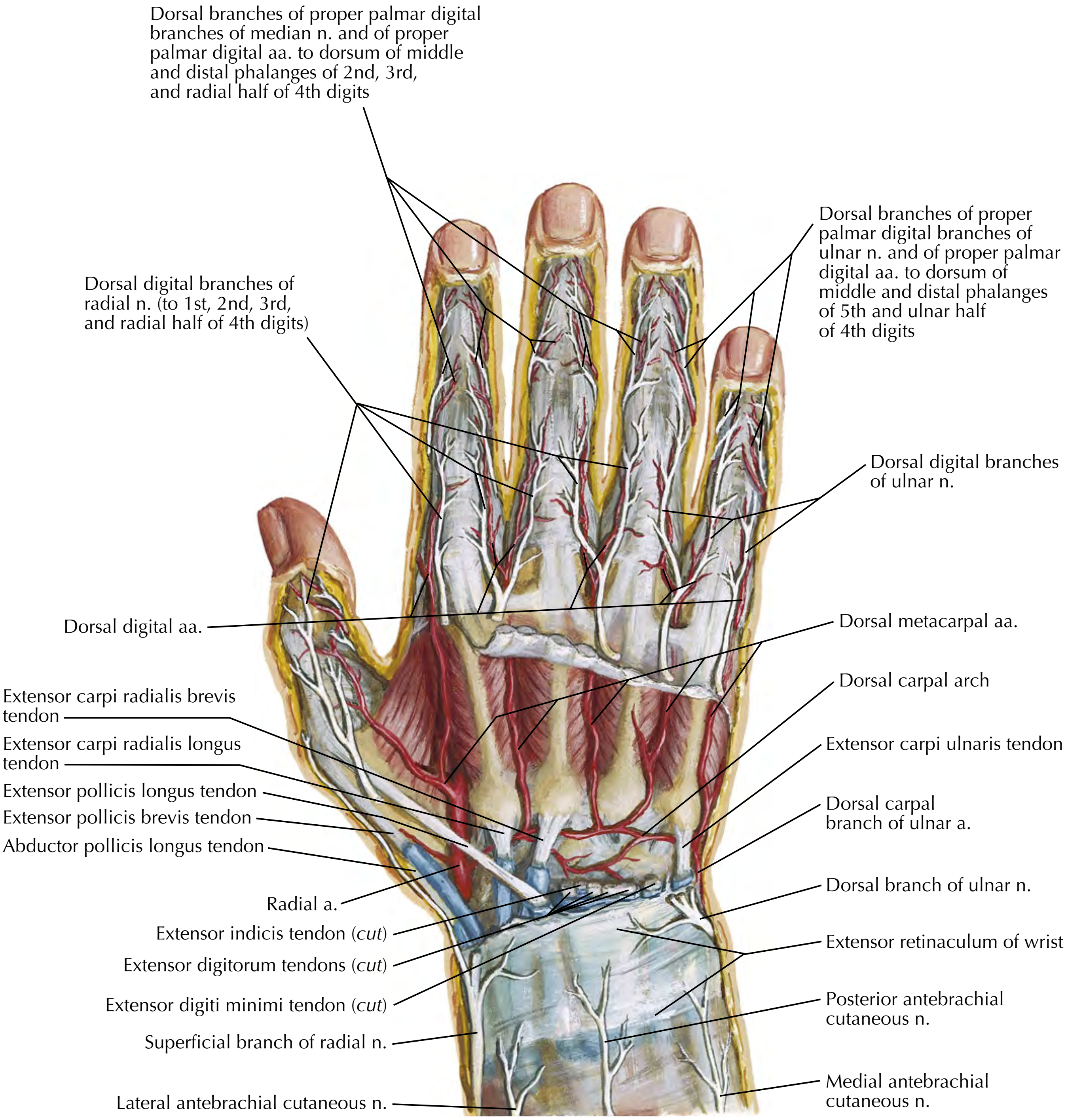
Wrist and Hand: Superficial Dorsal Dissection

See also **Plate 425**


Dorsal branches of proper palmar digital nn.
Dorsal digital nn. and vv.
Intercapitular vv.
Probe passes through the dorsal fascia of hand
Dorsal metacarpal vv.
Dorsal venous network of hand
Dorsal branch of ulnar n.
Basilic v.
Communicating branches of radial and ulnar nn.
Extensor retinaculum of wrist
Superficial branch of radial n.
Cephalic v.
Posterior antebrachial cutaneous n.

Note: Lymph vessels shown in black; arrows indicate direction of drainage.

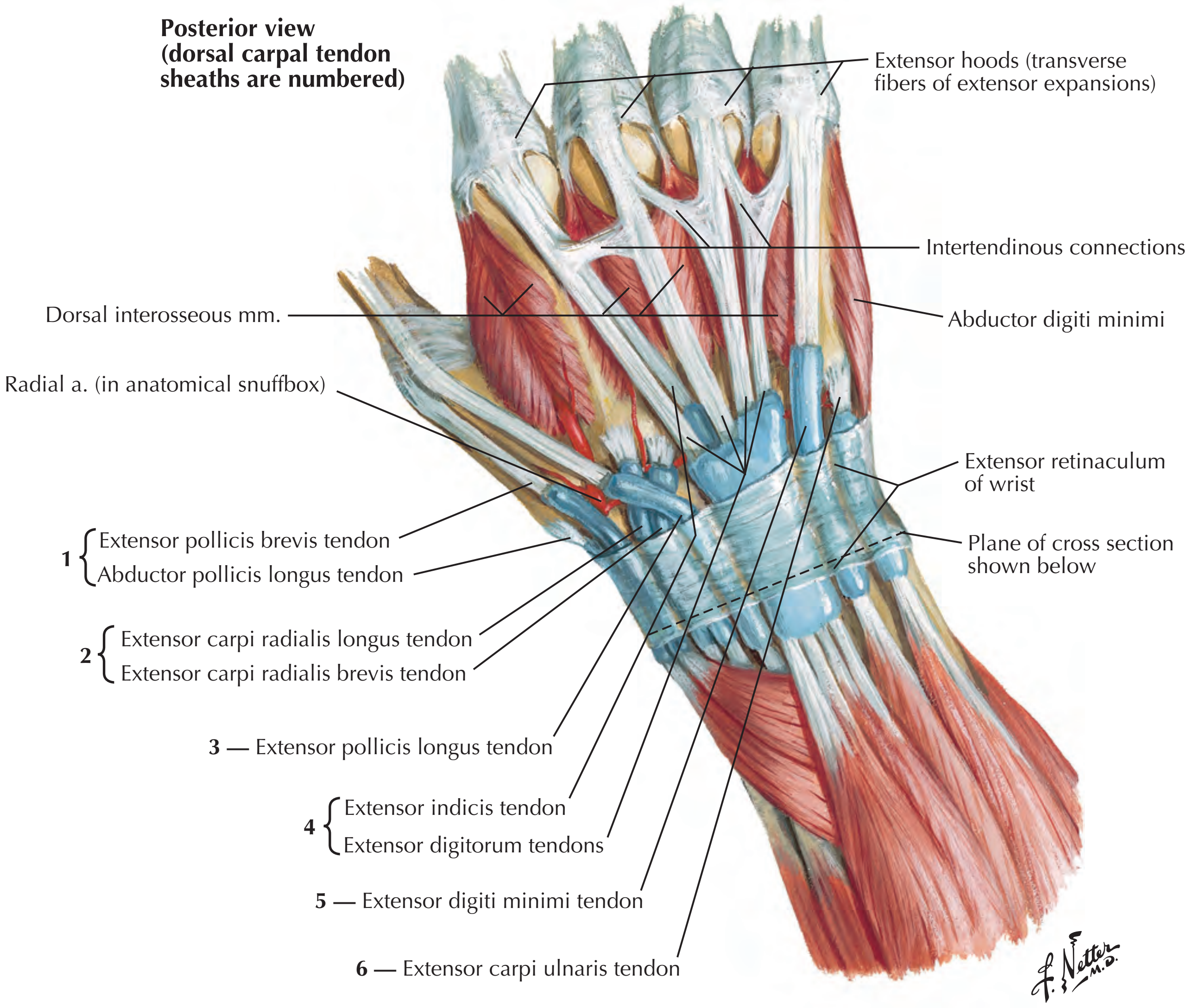
See also **Plate 480**


Dorsal branches of proper palmar digital branches of median n. and of proper palmar digital aa. to dorsum of middle and distal phalanges of 2nd, 3rd, and radial half of 4th digits
Dorsal branches of proper palmar digital branches of ulnar n. and of proper palmar digital aa. to dorsum of middle and distal phalanges of 5th and ulnar half of 4th digits
Dorsal digital branches of radial n. (to 1st, 2nd, 3rd, and radial half of 4th digits)
Dorsal digital branches of ulnar n.
Dorsal digital aa.
Dorsal metacarpal aa.
Dorsal carpal arch
Extensor carpi radialis brevis tendon
Extensor carpi radialis longus tendon
Extensor carpi ulnaris tendon
Extensor pollicis longus tendon
Extensor pollicis brevis tendon
Dorsal carpal branch of ulnar a.
Abductor pollicis longus tendon
Radial a.
Dorsal branch of ulnar n.
Extensor indicis tendon (*cut*)
Extensor retinaculum of wrist
Extensor digitorum tendons (*cut*)
Extensor digiti minimi tendon (*cut*)
Posterior antebrachial cutaneous n.
Superficial branch of radial n.
Medial antebrachial cutaneous n.
Lateral antebrachial cutaneous n.

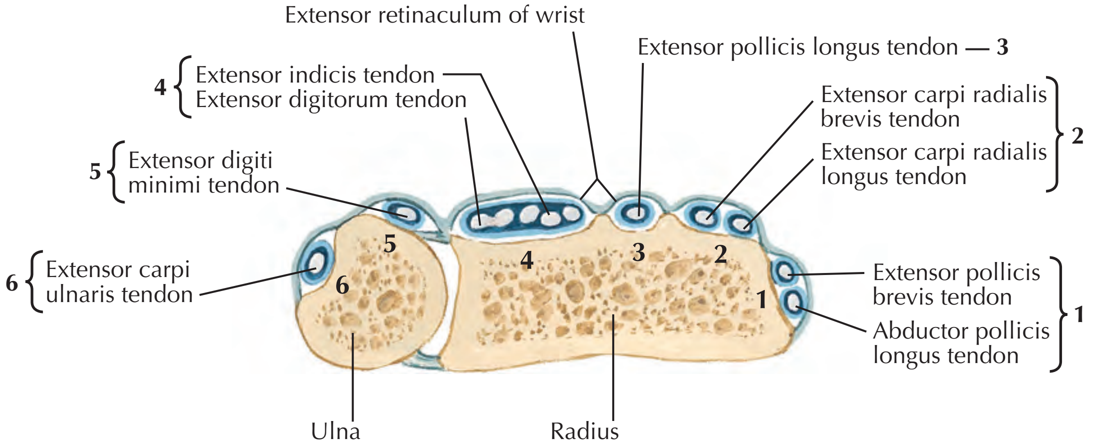
Extensor Tendons at Wrist

See also **Plates 454, 455**

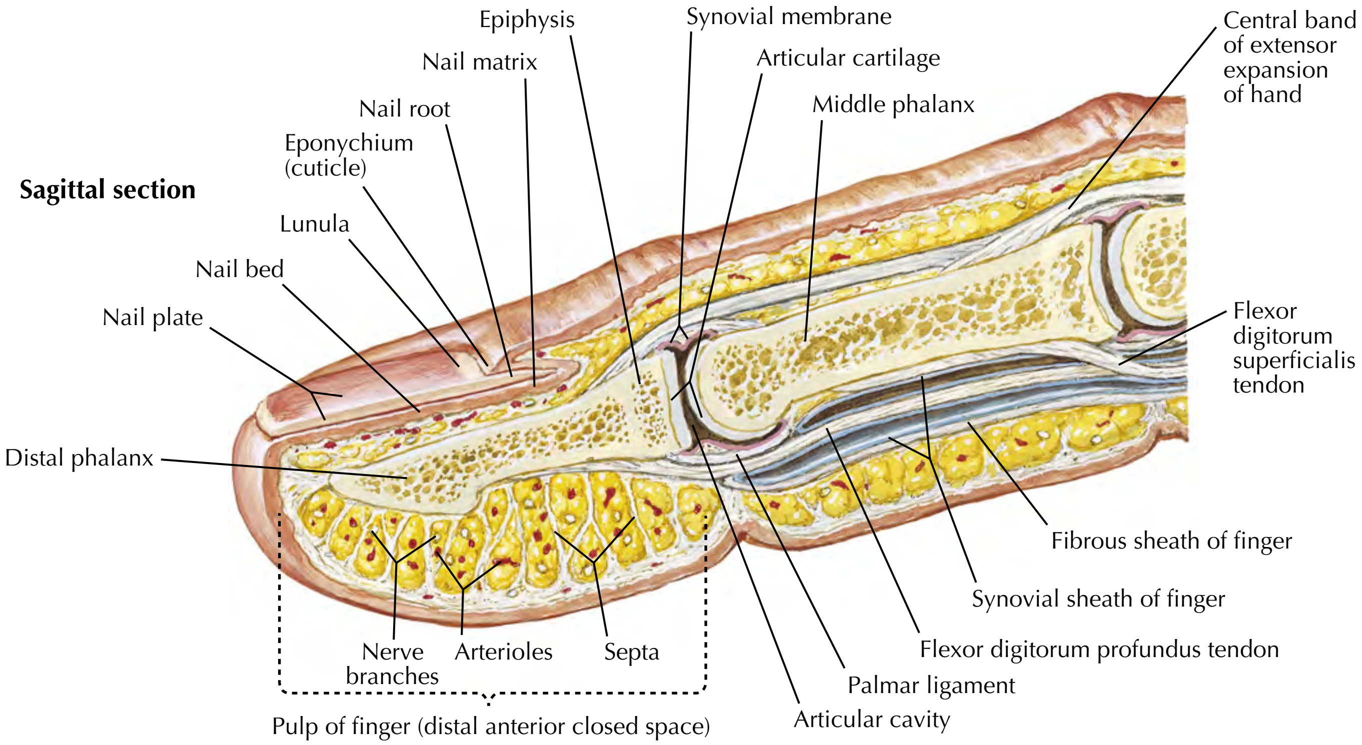
Posterior view (dorsal carpal tendon sheaths are numbered)


Extensor hoods (transverse fibers of extensor expansions)
Intertendinous connections
Dorsal interosseous mm.
Abductor digiti minimi
Radial a. (in anatomical snuffbox)
Extensor retinaculum of wrist
Plane of cross section shown below
1 Extensor pollicis brevis tendon
1 Abductor pollicis longus tendon
2 Extensor carpi radialis longus tendon
2 Extensor carpi radialis brevis tendon
3 — Extensor pollicis longus tendon
4 Extensor indicis tendon
4 Extensor digitorum tendons
5 — Extensor digiti minimi tendon
6 — Extensor carpi ulnaris tendon

Cross section of distal forearm


Extensor retinaculum of wrist
Extensor pollicis longus tendon — 3
4 Extensor indicis tendon
4 Extensor digitorum tendon
Extensor carpi radialis brevis tendon 2
Extensor carpi radialis longus tendon 2
5 Extensor digiti minimi tendon
6 Extensor carpi ulnaris tendon
Extensor pollicis brevis tendon 1
Abductor pollicis longus tendon 1
5
4
3
2
6
1
Ulna
Radius

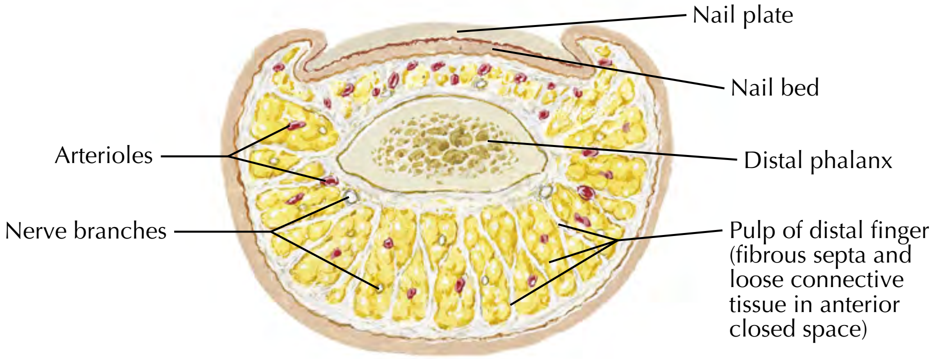
Fingers



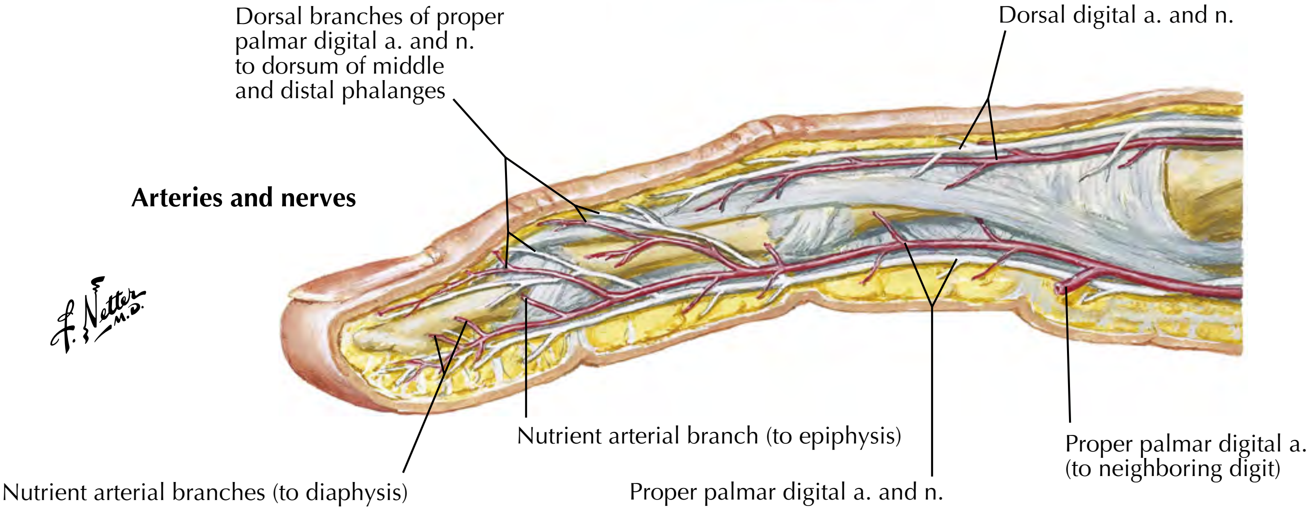
Sagittal section

Epiphysis
Synovial membrane
Articular cartilage
Central band of extensor expansion of hand
Nail matrix
Middle phalanx
Nail root
Eponychium (cuticle)
Lunula
Nail bed
Nail plate
Flexor digitorum superficialis tendon
Distal phalanx
Fibrous sheath of finger
Synovial sheath of finger
Nerve branches
Arterioles
Septa
Flexor digitorum profundus tendon
Palmar ligament
Articular cavity
Pulp of finger (distal anterior closed space)

Cross section through distal finger



Nail plate
Nail bed
Arterioles
Distal phalanx
Nerve branches
Pulp of distal finger (fibrous septa and loose connective tissue in anterior closed space)

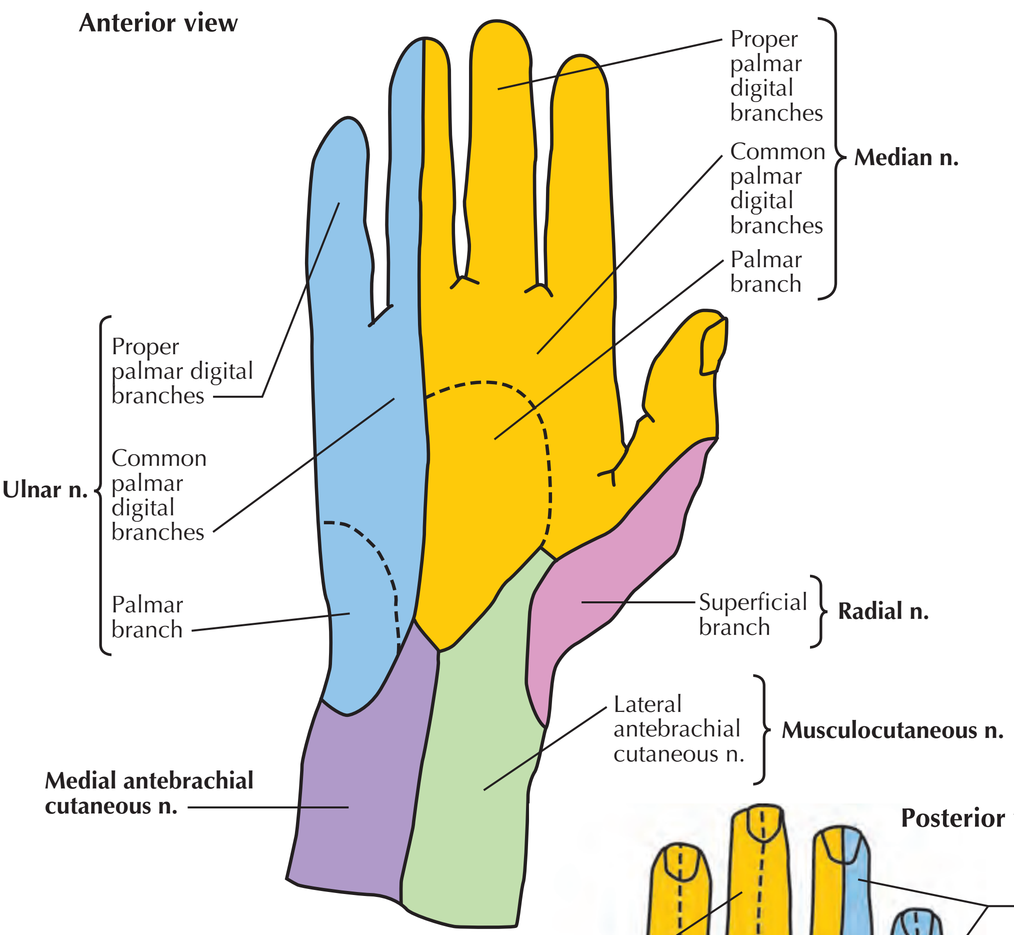


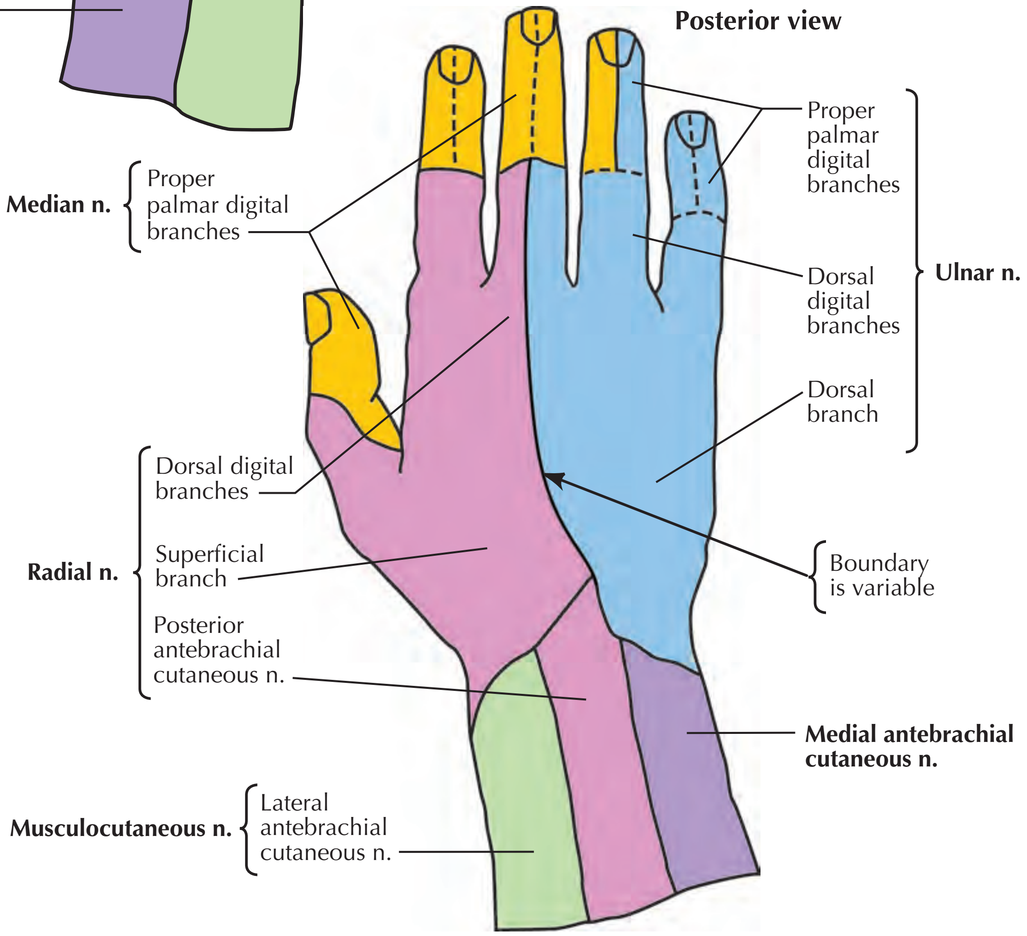
Arteries and nerves

Dorsal branches of proper palmar digital a. and n. to dorsum of middle and distal phalanges
Dorsal digital a. and n.
Nutrient arterial branch (to epiphysis)
Proper palmar digital a. (to neighboring digit)
Nutrient arterial branches (to diaphysis)
Proper palmar digital a. and n.

Cutaneous Innervation of Wrist and Hand

See also **Plates 423, 472**


Anterior view
Proper palmar digital branches
Common palmar digital branches
Palmar branch
Median n.
Proper palmar digital branches
Common palmar digital branches
Palmar branch
Ulnar n.
Superficial branch
Radial n.
Lateral antebrachial cutaneous n.
Musculocutaneous n.
Medial antebrachial cutaneous n.


Posterior view
Median n.
Proper palmar digital branches
Proper palmar digital branches
Dorsal digital branches
Dorsal branch
Ulnar n.
Dorsal digital branches
Superficial branch
Posterior antebrachial cutaneous n.
Radial n.
Boundary is variable
Medial antebrachial cutaneous n.
Lateral antebrachial cutaneous n.
Musculocutaneous n.

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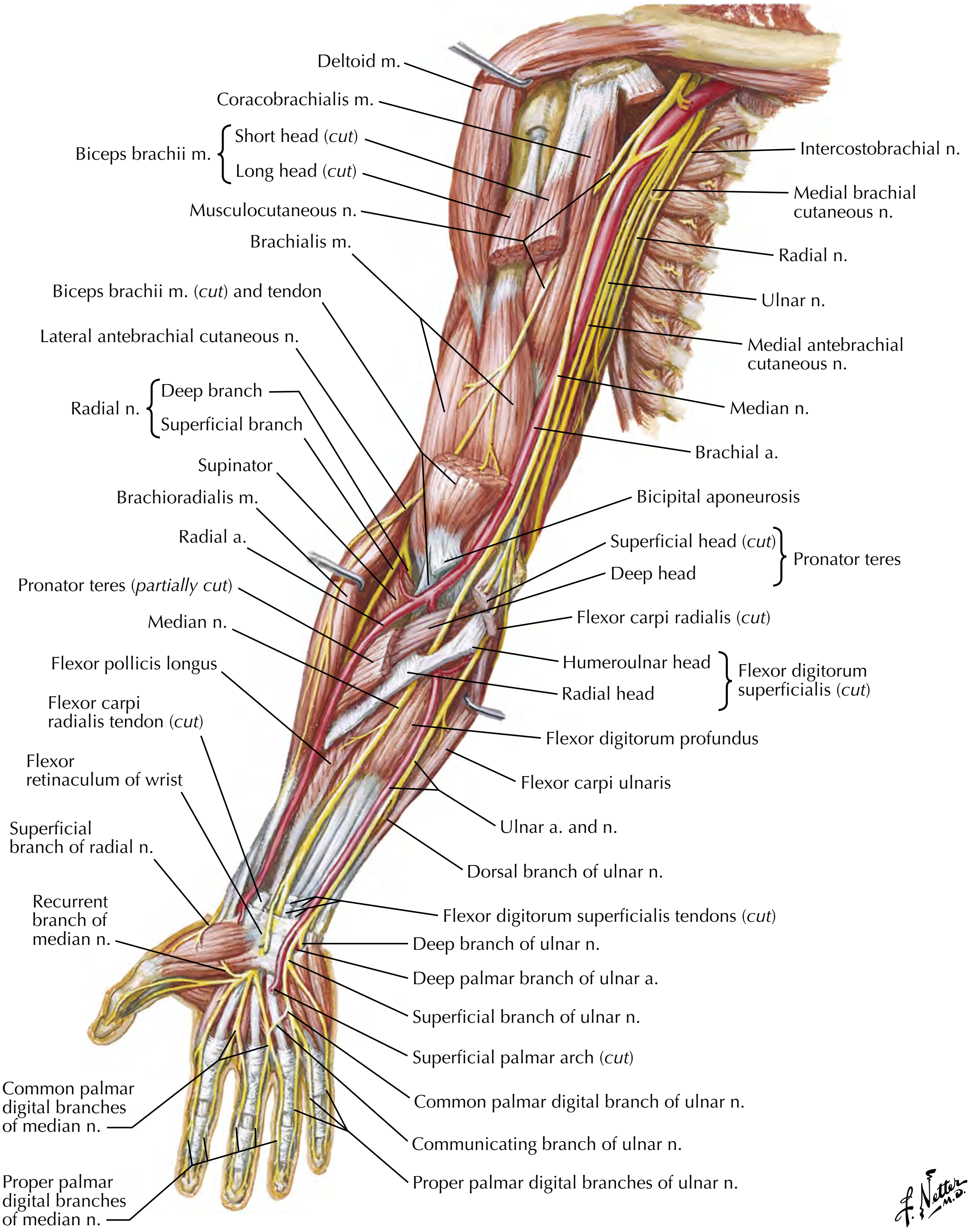
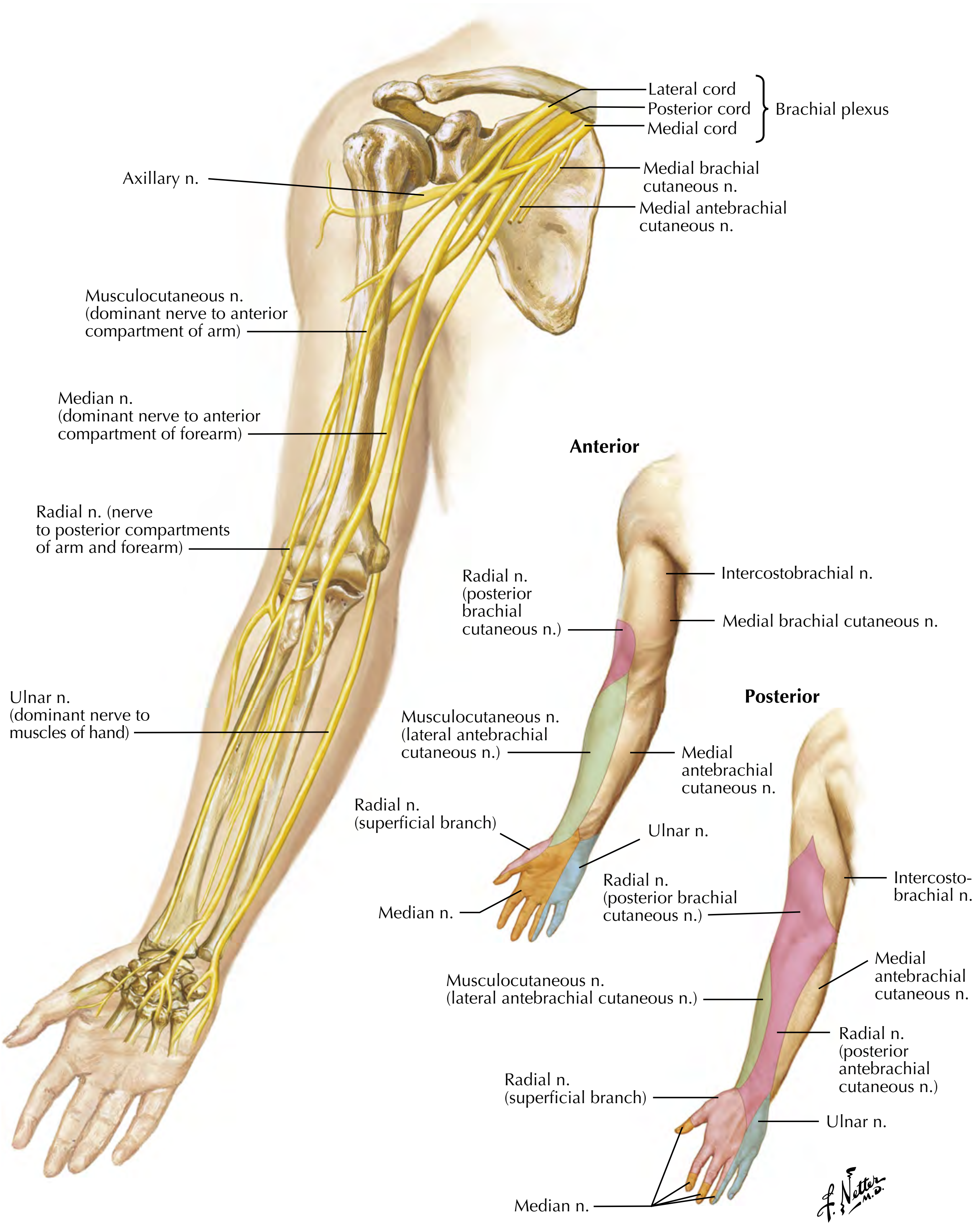
Arteries and Nerves of Upper Limb: Anterior View

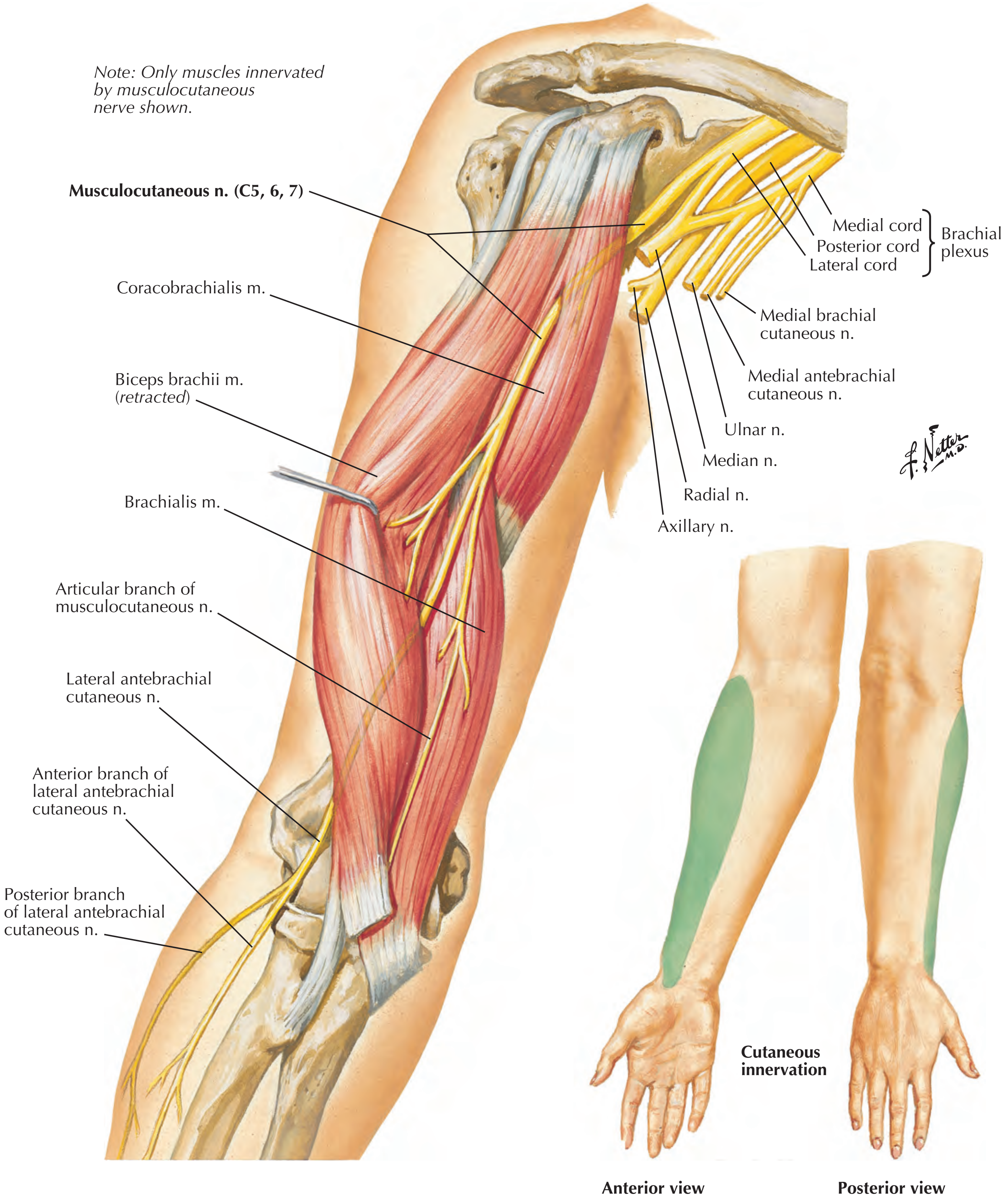
See also **Plates 442, 458**


Deltoid m.
Coracobrachialis m.
Biceps brachii m.
Short head (*cut*)
Long head (*cut*)
Musculocutaneous n.
Brachialis m.
Biceps brachii m. (*cut*) and tendon
Lateral antebrachial cutaneous n.
Radial n.
Deep branch
Superficial branch
Supinator
Brachioradialis m.
Radial a.
Pronator teres (*partially cut*)
Median n.
Flexor pollicis longus
Flexor carpi radialis tendon (*cut*)
Flexor retinaculum of wrist
Superficial branch of radial n.
Recurrent branch of median n.
Common palmar digital branches of median n.
Proper palmar digital branches of median n.
Intercostobrachial n.
Medial brachial cutaneous n.
Radial n.
Ulnar n.
Medial antebrachial cutaneous n.
Median n.
Brachial a.
Bicipital aponeurosis
Superficial head (*cut*)
Deep head
Pronator teres
Flexor carpi radialis (*cut*)
Humeroulnar head
Radial head
Flexor digitorum superficialis (*cut*)
Flexor digitorum profundus
Flexor carpi ulnaris
Ulnar a. and n.
Dorsal branch of ulnar n.
Flexor digitorum superficialis tendons (*cut*)
Deep branch of ulnar n.
Deep palmar branch of ulnar a.
Superficial branch of ulnar n.
Superficial palmar arch (*cut*)
Common palmar digital branch of ulnar n.
Communicating branch of ulnar n.
Proper palmar digital branches of ulnar n.


Lateral cord
Posterior cord
Medial cord
Brachial plexus
Axillary n.
Medial brachial cutaneous n.
Medial antebrachial cutaneous n.
Musculocutaneous n. (dominant nerve to anterior compartment of arm)
Median n. (dominant nerve to anterior compartment of forearm)
Radial n. (nerve to posterior compartments of arm and forearm)
Ulnar n. (dominant nerve to muscles of hand)
Anterior
Radial n. (posterior brachial cutaneous n.)
Intercostobrachial n.
Medial brachial cutaneous n.
Musculocutaneous n. (lateral antebrachial cutaneous n.)
Medial antebrachial cutaneous n.
Radial n. (superficial branch)
Ulnar n.
Median n.
Posterior
Radial n. (posterior brachial cutaneous n.)
Intercosto-brachial n.
Medial antebrachial cutaneous n.
Musculocutaneous n. (lateral antebrachial cutaneous n.)
Radial n. (posterior antebrachial cutaneous n.)
Radial n. (superficial branch)
Ulnar n.
Median n.

Musculocutaneous Nerve

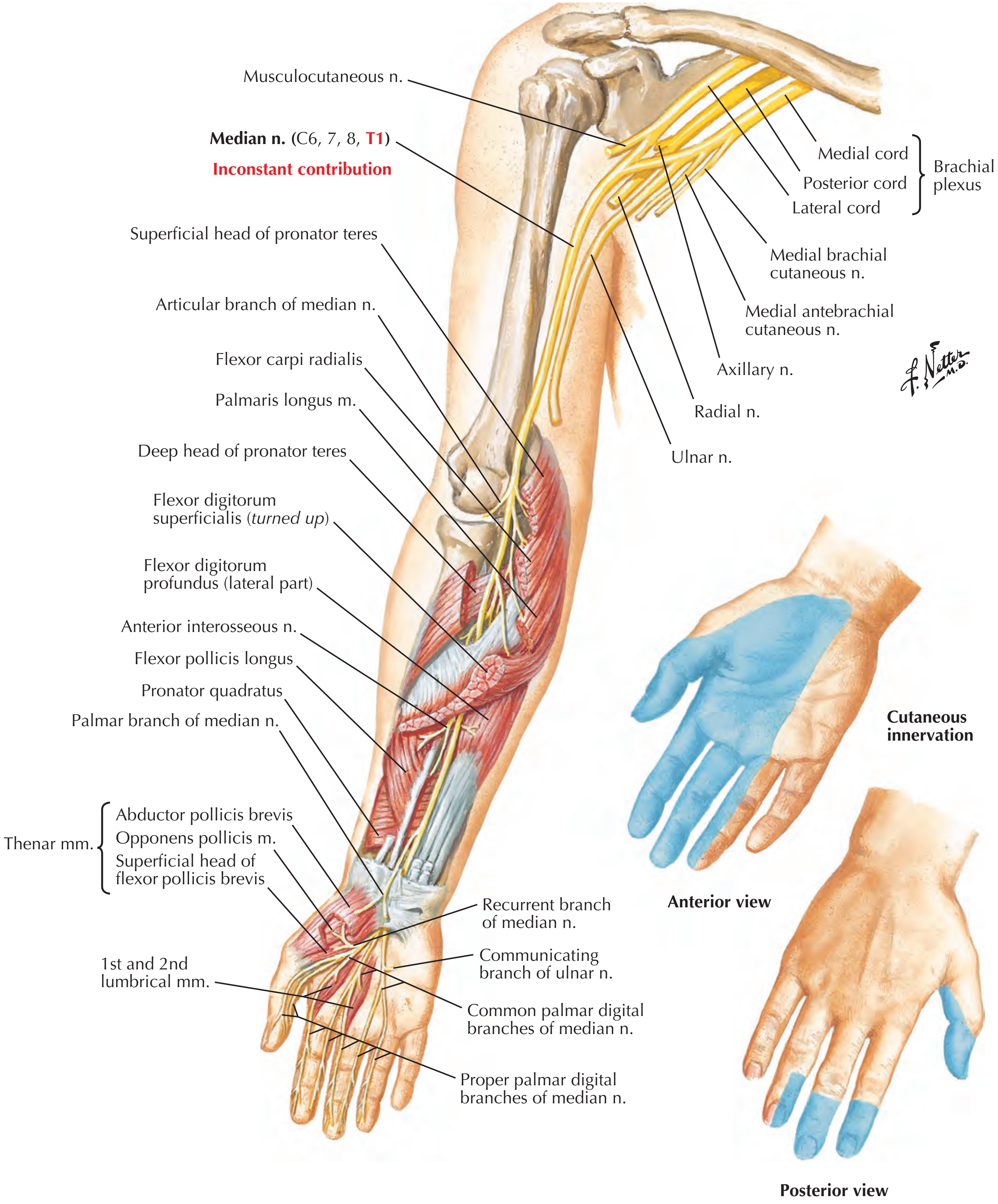
See also **Plate 440**


Note: Only muscles innervated by musculocutaneous nerve shown.
Musculocutaneous n. (C5, 6, 7)
Coracobrachialis m.
Biceps brachii m. (*retracted*)
Brachialis m.
Articular branch of musculocutaneous n.
Lateral antebrachial cutaneous n.
Anterior branch of lateral antebrachial cutaneous n.
Posterior branch of lateral antebrachial cutaneous n.
Medial cord
Posterior cord
Lateral cord
Brachial plexus
Medial brachial cutaneous n.
Medial antebrachial cutaneous n.
Ulnar n.
Median n.
Radial n.
Axillary n.
Cutaneous innervation
Anterior view
Posterior view

Median Nerve

See also **Plates 423, 456, 457**

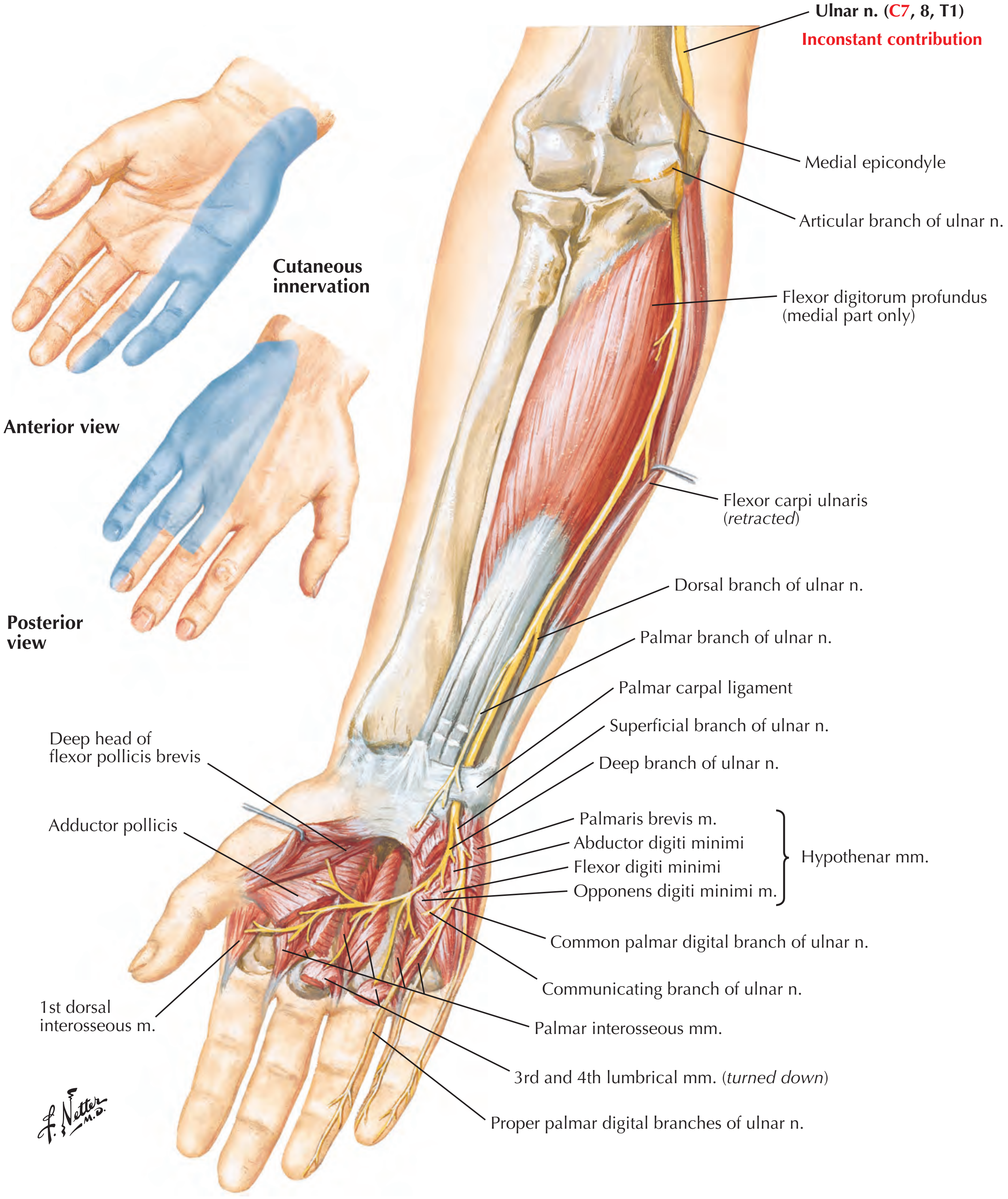
Note: Only muscles innervated by median nerve shown.


Musculocutaneous n.
Median n. (C6, 7, 8, T1)
Inconstant contribution
Superficial head of pronator teres
Articular branch of median n.
Flexor carpi radialis
Palmaris longus m.
Deep head of pronator teres
Flexor digitorum superficialis (*turned up*)
Flexor digitorum profundus (lateral part)
Anterior interosseous n.
Flexor pollicis longus
Pronator quadratus
Palmar branch of median n.
Thenar mm.
Abductor pollicis brevis
Opponens pollicis m.
Superficial head of flexor pollicis brevis
1st and 2nd lumbrical mm.
Medial cord
Posterior cord
Lateral cord
Brachial plexus
Medial brachial cutaneous n.
Medial antebrachial cutaneous n.
Axillary n.
Radial n.
Ulnar n.
Recurrent branch of median n.
Communicating branch of ulnar n.
Common palmar digital branches of median n.
Proper palmar digital branches of median n.
F. Netter M.D.
Cutaneous innervation
Anterior view
Posterior view

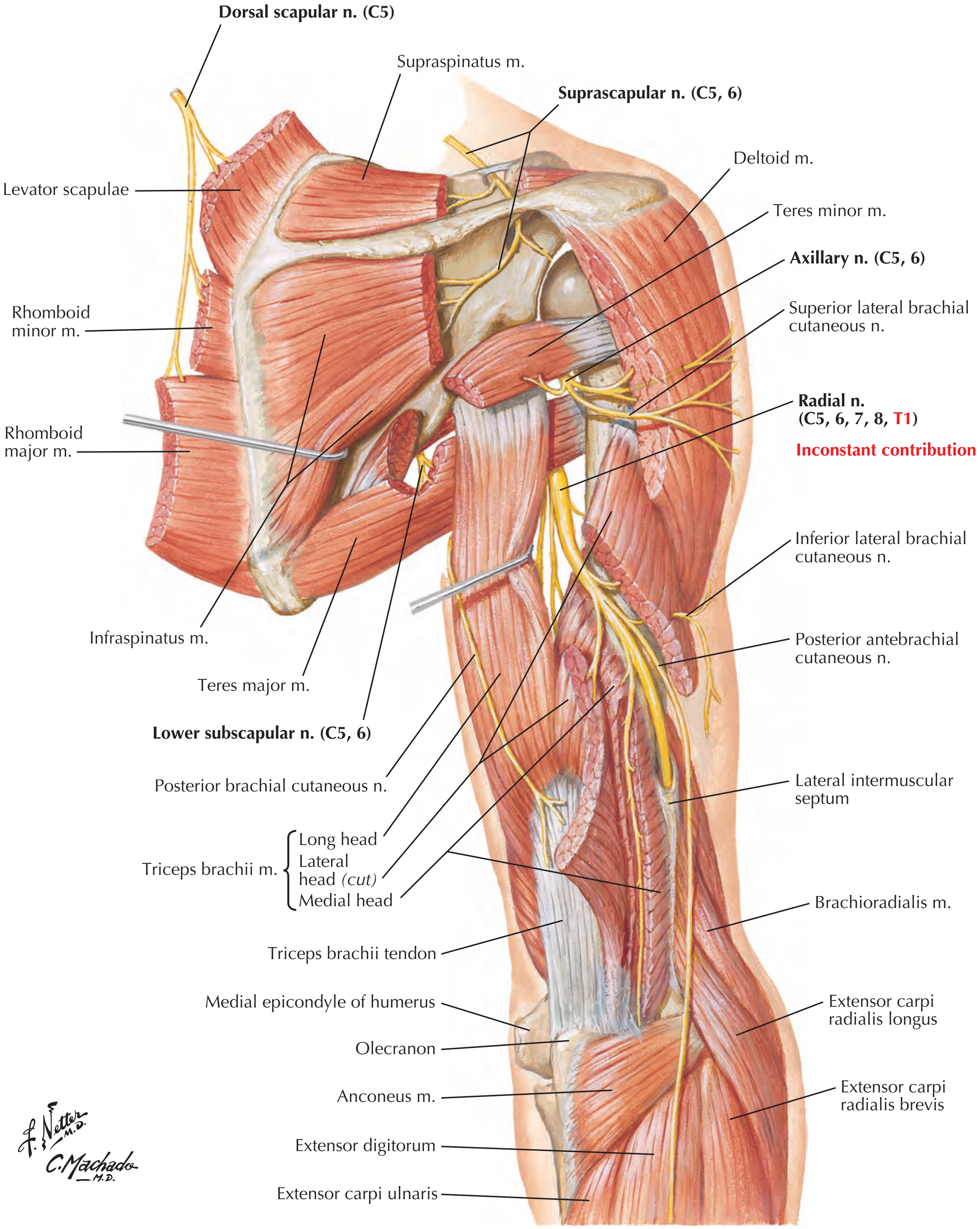
Ulnar Nerve

See also **Plates 456, 457**

Note: Only muscles innervated by ulnar nerve shown.

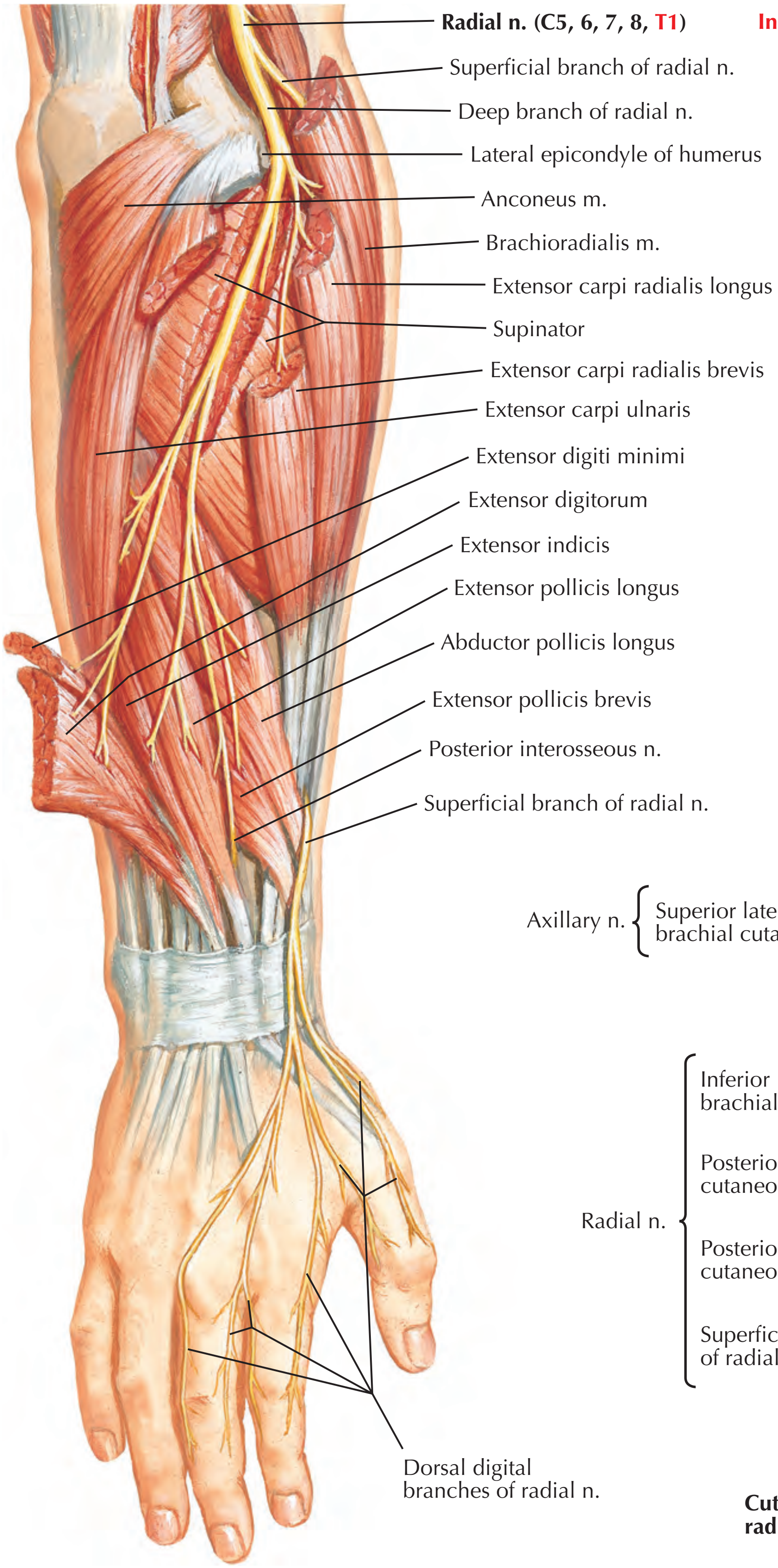

Ulnar n. (C7, 8, T1)
Inconstant contribution
Medial epicondyle
Articular branch of ulnar n.
Flexor digitorum profundus (medial part only)
Flexor carpi ulnaris (*retracted*)
Dorsal branch of ulnar n.
Palmar branch of ulnar n.
Palmar carpal ligament
Superficial branch of ulnar n.
Deep branch of ulnar n.
Palmaris brevis m.
Abductor digiti minimi
Flexor digiti minimi
Opponens digiti minimi m.
Hypothenar mm.
Common palmar digital branch of ulnar n.
Communicating branch of ulnar n.
Palmar interosseous mm.
3rd and 4th lumbrical mm. (*turned down*)
Proper palmar digital branches of ulnar n.
Deep head of flexor pollicis brevis
Adductor pollicis
1st dorsal interosseous m.
Cutaneous innervation
Anterior view
Posterior view

See also Plates 436, 441

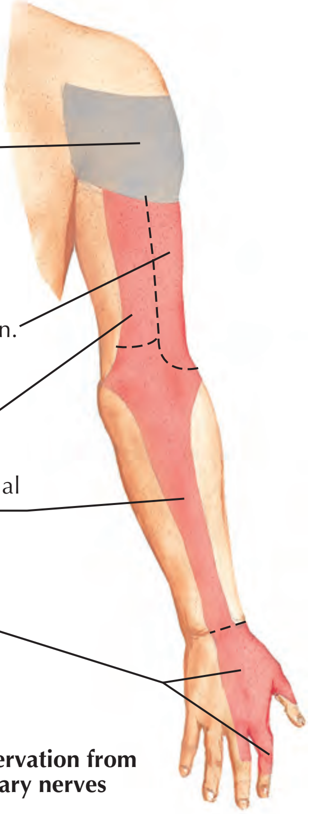

Dorsal scapular n. (C5)
Supraspinatus m.
Suprascapular n. (C5, 6)
Deltoid m.
Levator scapulae
Teres minor m.
Axillary n. (C5, 6)
Superior lateral brachial cutaneous n.
Rhomboid minor m.
Radial n. (C5, 6, 7, 8, T1)
Inconstant contribution
Rhomboid major m.
Inferior lateral brachial cutaneous n.
Posterior antebrachial cutaneous n.
Infraspinatus m.
Teres major m.
Lower subscapular n. (C5, 6)
Posterior brachial cutaneous n.
Lateral intermuscular septum
Triceps brachii m.
Long head
Lateral head (cut)
Medial head
Brachioradialis m.
Triceps brachii tendon
Medial epicondyle of humerus
Extensor carpi radialis longus
Olecranon
Anconeus m.
Extensor carpi radialis brevis
Extensor digitorum
Extensor carpi ulnaris
F. Netter M.D.
C. Machado M.D.

Radial Nerve in Forearm and Hand

See also **Plates 454, 477**


Radial n. (C5, 6, 7, 8, T1)
Superficial branch of radial n.
Deep branch of radial n.
Lateral epicondyle of humerus
Anconeus m.
Brachioradialis m.
Extensor carpi radialis longus
Supinator
Extensor carpi radialis brevis
Extensor carpi ulnaris
Extensor digiti minimi
Extensor digitorum
Extensor indicis
Extensor pollicis longus
Abductor pollicis longus
Extensor pollicis brevis
Posterior interosseous n.
Superficial branch of radial n.
Dorsal digital branches of radial n.

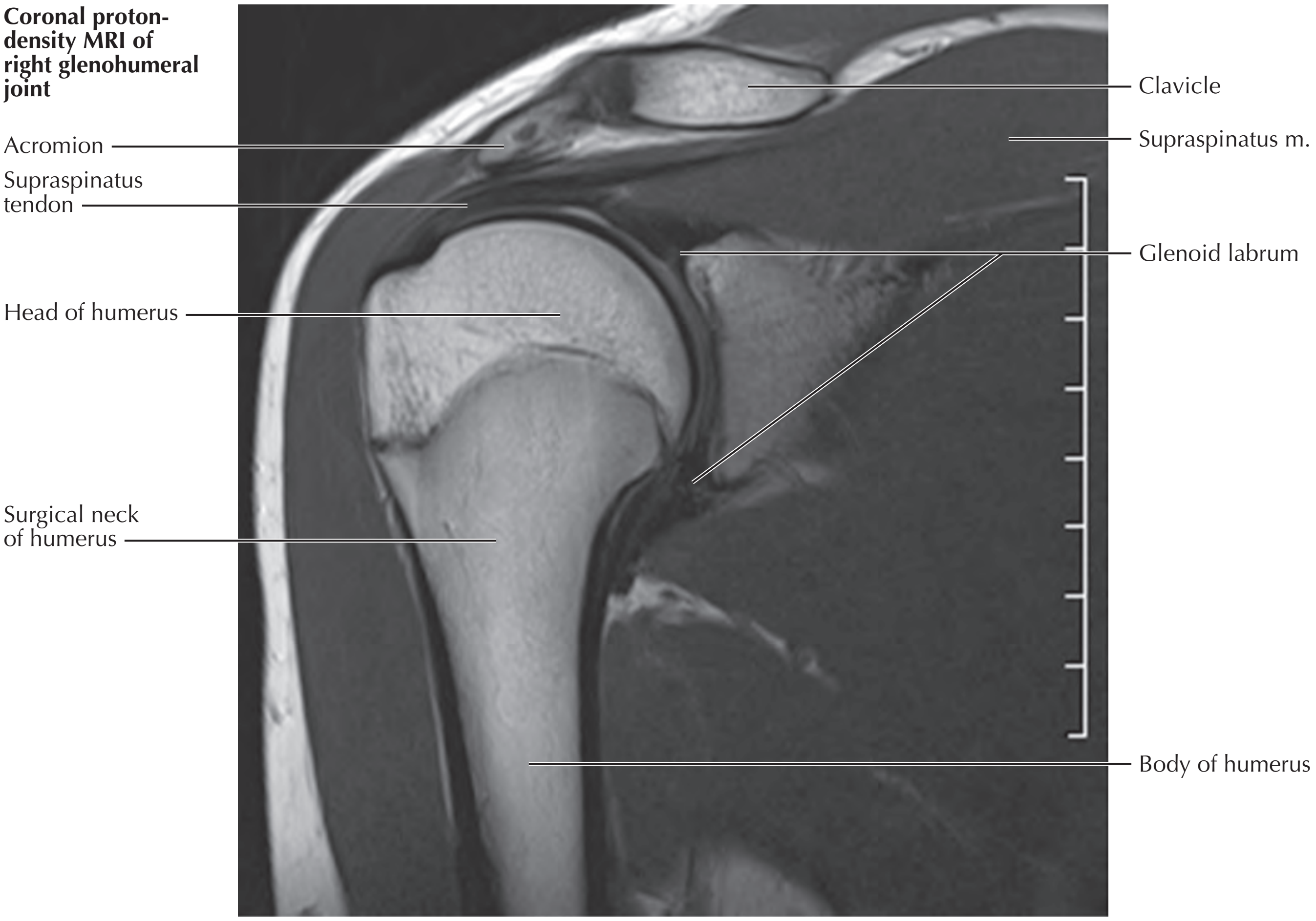
Inconstant contribution


Axillary n.
Superior lateral brachial cutaneous n.
Radial n.
Inferior lateral brachial cutaneous n.
Posterior brachial cutaneous n.
Posterior antebrachial cutaneous n.
Superficial branch of radial n.

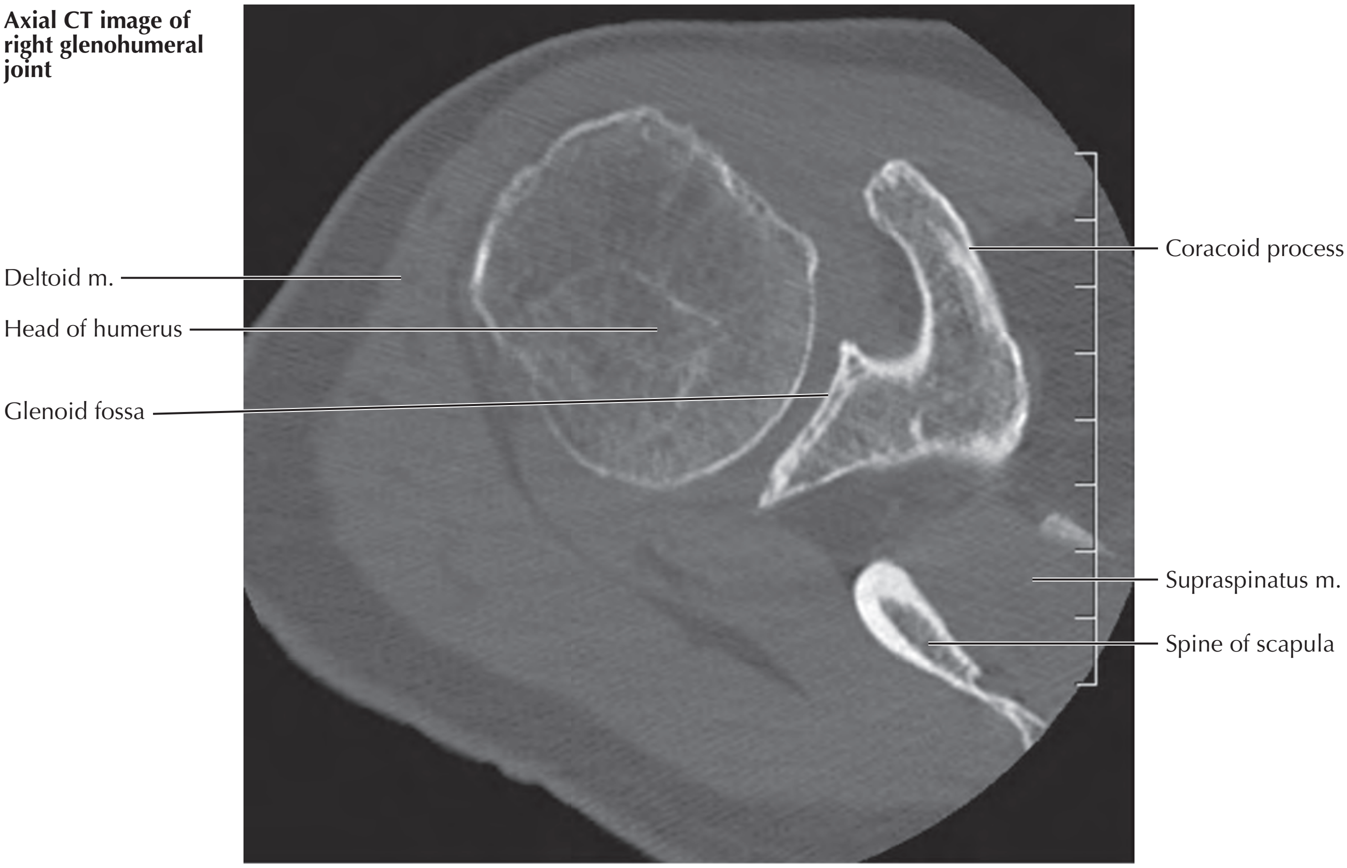
Cutaneous innervation from radial and axillary nerves

See also **Plates 263, 431**

Coronal proton-density MRI of right glenohumeral joint


Acromion
Supraspinatus tendon
Head of humerus
Surgical neck of humerus
Clavicle
Supraspinatus m.
Glenoid labrum
Body of humerus

Axial CT image of right glenohumeral joint


Deltoid m.
Head of humerus
Glenoid fossa
Coracoid process
Supraspinatus m.
Spine of scapula

Structures with High* Clinical Significance

ANATOMICAL STRUCTURE	CLINICAL COMMENT	PLATE NUMBERS
Nervous System and Sense Organs		
Long thoracic nerve	Injury may produce "winged scapula" caused by denervation of serratus anterior muscle; can be injured with repetitive overhead motion	436, 438
Axillary nerve	Position of nerve close to surgical neck of humerus makes it vulnerable to injury with fractures or dislocations of humerus; poorly fitting crutches can also compress axillary nerve	441
Median nerve	Compressed in carpal tunnel syndrome, producing pain and paresthesia in lateral three and one-half digits; major risk factors include obesity, pregnancy, diabetes, and hypothyroidism	470, 486
Recurrent branch of median nerve	May be injured in superficial lacerations of palm over thenar eminence	469
Ulnar nerve	Vulnerable to compression or injury where it passes posterior to medial epicondyle of humerus, and at wrist in ulnar tunnel (Guyon's canal)	483, 487
Radial nerve	Vulnerable to compression or injury where it lies against humerus in radial groove (e.g., with humerus fracture); common symptom is wrist drop due to weakness of wrist extensors; poorly fitting crutches can also compress radial nerve	488, 489
Skeletal System		
Clavicle	Most clavicular fractures are caused from fall on outstretched arm or direct trauma delivered to lateral side of shoulder; middle third of clavicle is most commonly fractured; supraclavicular nerve block relieves acute pain associated with fracture	427, 429
Humerus	Proximal humerus, especially surgical neck, is fractured due to low-energy falls in elderly persons and high-energy trauma in young persons; axillary nerve and circumflex humeral arteries can be injured; hematoma from anterior/posterior circumflex humeral artery damage as result of dislocation may complicate reductions; midbody fractures are also relatively common and may affect radial nerve and/or deep brachial artery; distal humerus fractures may affect ulnar nerve medially and radial nerve laterally	427, 428, 430
Ulna	Subcutaneous location of olecranon makes it vulnerable to fracture by direct trauma, especially when elbow is flexed; ulnar styloid process may also be fractured with distal radial fractures	446, 449
Radius	Fractures of distal radius are most common fracture of upper limb (Colles' fracture), typically caused by fall on outstretched hand (FOOSH)	449
Scaphoid bone	Most commonly fractured carpal bone, typically from fall on outstretched hand (FOOSH)	459, 460, 462
Muscular System		
Palmar aponeurosis	Progressive fibrosis may result in nodules and eventually a palpable cord that limits finger extension (Dupuytren's contracture)	469
Rotator cuff muscles	Injuries to this group of muscles can result from acute injury or chronic overuse and are a common cause of shoulder pain and disability	431, 434, 441
Supraspinatus tendon	Most commonly torn rotator cuff tendon	434–436, 441
Biceps brachii tendon	Can rupture from sudden load on muscle when contracting; used in flexor compartment reflex assessing C5 and C6 spinal nerves	440, 442
Long head of biceps brachii muscle	Tendon of long head of biceps brachii muscle can cause shoulder pain from tendinosis of intraarticular portion and can rupture in elderly persons from falls on outstretched arm; when long head has been ruptured, it usually tears from supraglenoid tubercle and retracts down into arm; muscle commonly bulges (Popeye deformity) at midbody of humerus; spontaneous rupture may occur in amyloidosis, infiltrative disease that also causes cardiomyopathy	440

ANATOMICAL STRUCTURE	CLINICAL COMMENT	PLATE NUMBERS
Muscles of posterior compartment of forearm	Repetitive use of muscles arising from common extensor origin can damage tendons and produce pain over lateral epicondyle region (epicondylitis); activities such as swinging tennis racquet and poor technique with hammer can result in "tennis elbow"; muscle most likely involved is extensor carpi radialis brevis	451
Muscles of anterior compartment of forearm	Repetitive use of muscles arising from common flexor origin can damage tendons and produce pain over medial epicondyle region (golfer's elbow)	452, 453
Cardiovascular System		
Median cubital vein	Accessed in cubital fossa for venipuncture	424
Suprascapular, dorsal scapular, and circumflex scapular arteries	Provide collateral circulation around scapula, allowing blood to reach distal part of upper limb if axillary artery is blocked or compressed	437
Brachial artery	During deflation of sphygmomanometer on upper arm, brachial artery is auscultated for Korotkoff sounds to measure systolic and diastolic blood pressure; identified medial to biceps brachii tendon and deep to bicipital aponeurosis in cubital fossa	442, 443
Radial artery	Palpated at lateral aspect of wrist to assess radial pulse; common site of vascular access for percutaneous cardiac procedures, such as angioplasty, and for sampling of arterial blood	14, 443
Ulnar artery	Provides important collateral circulation to hand via palmar arch during catheterization of radial artery; patency is assessed prior to procedure using Allen test, in which both radial and ulnar arteries are compressed, then pressure over ulnar artery is released; return of color to wrist within a few seconds indicates patent ulnar artery	443, 476

*Selections were based largely on clinical data and commonly discussed clinical correlations in macroscopic ("gross") anatomy courses.

Nerves of Brachial Plexus

The roots of the brachial plexus are typically the anterior rami of the C5–T1 spinal nerves. Variation in the spinal nerve contributions to the plexus, and the nerves that arise from this plexus, is common, due to prefixed (high) and postfixed (low) plexuses.

NERVE	ORIGIN	COURSE	BRANCHES	MOTOR	CUTANEOUS
Dorsal scapular nerve	Anterior ramus of C5 spinal nerve	Pierces scalenus medius muscle to run posteriorly and inferiorly on levator scapulae along vertebral border of scapula		Rhomboid major and minor muscles, levator scapulae	
Long thoracic nerve	Anterior rami of C5–C7 spinal nerves	C5–C6 join within scalenus medius muscle, and at 1st rib are joined by C7; runs inferiorly and posterior to brachial plexus and axillary vessels; follows midaxillary line on surface of serratus anterior muscle		Serratus anterior muscle	
Suprascapular nerve	Superior trunk (C5–C6)	Traverses posterior cervical triangle, coursing posterior to inferior belly of omohyoid muscle and border of trapezius muscle to pass through scapular notch deep to superior transverse scapular ligament; continues laterally and then through spinoglenoid notch into infraspinous fossa		Supraspinatus and infraspinatus muscles	
Subclavian nerve	Superior trunk (C5–C6)	Runs inferiorly at distal aspect of anterior rami		Subclavius muscle	
Lateral pectoral nerve	Lateral cord (C5–C7)	Emerges lateral and superficial to axillary artery and vein, coursing just medial to pectoralis minor muscle		Pectoralis major and minor muscles	
Musculocutaneous nerve	Lateral cord (C5–C7)	Emerges at inferior border of pectoralis minor muscle, pierces coracobrachialis muscle to run between brachialis and biceps brachii muscles; just proximal to elbow, pierces deep fascia to continue as lateral antebrachial cutaneous nerve	Muscular branches, lateral antebrachial cutaneous nerve	Anterior compartment of arm	See lateral antebrachial cutaneous nerve
Lateral antebrachial cutaneous nerve	Musculocutaneous nerve	Runs posterior to cephalic vein and travels along lateral surface of forearm	Divides at elbow joint into anterior and posterior branches		Lateral forearm
Subscapular nerves	Posterior cord (C5–C6)	Upper and lower subscapular nerves emerge to traverse anterior surface of subscapularis muscle; lower subscapular nerve ends in teres major muscle		Teres major and subscapularis muscles	
Thoracodorsal nerve	Posterior cord (C6–C8)	Emerges between upper and lower subscapular nerves, courses with thoracodorsal artery along posterior axillary wall, diving deep to latissimus dorsi muscle		Latissimus dorsi muscle	
Radial nerve	Posterior cord (C5–T1)	Runs anterior to latissimus dorsi muscle to inferior border of teres major muscle, where it accompanies deep brachial artery along radial groove of humerus to course between medial and lateral heads of triceps brachii muscle	Posterior and inferior lateral brachial cutaneous nerves, posterior antebrachial cutaneous nerve, muscular, deep, and superficial branches and posterior interosseous nerve	Triceps brachii, anconeus, and brachioradialis muscles, extensores carpi radiales longus and brevis, supinator (also see posterior interosseous nerve)	Lateral part of dorsum of hand (also see cutaneous branches)
Posterior brachial cutaneous nerve	Radial nerve	Emerges from radial nerve in medial axilla			Posterior part of medial arm

NERVE	ORIGIN	COURSE	BRANCHES	MOTOR	CUTANEOUS
Inferior lateral brachial cutaneous nerve	Radial nerve	Perforates lateral head of triceps brachii muscle below deltoid tuberosity, coursing anteriorly with cephalic vein			Distal part of lateral arm
Posterior antebrachial cutaneous nerve	Radial nerve	Emerges from plane between lateral and medial heads of triceps brachii muscle to become cutaneous			Posterior part of lateral forearm
Posterior interosseous nerve	Deep branch of radial nerve	Continuation of deep radial nerve courses under cover of supinator distally along posterior surface of interosseous membrane of forearm		Posterior compartment of forearm (some exceptions)	
Axillary nerve	Posterior cord (C5–C6)	Passes anterior to subscapularis muscle to exit axilla with posterior circumflex humeral artery through quadrangular space	Muscular branches, superior lateral brachial cutaneous nerve	Deltoid and teres minor muscles	See superior lateral brachial cutaneous nerve
Superior lateral brachial cutaneous nerve	Axillary nerve	Pierces deep fascia at posteroinferior edge of deltoid muscle to become cutaneous			Proximal part of lateral arm
Medial pectoral nerve	Medial cord (C8–T1)	Emerges and runs between axillary artery and vein to pierce pectoralis minor muscle en route to pectoralis major muscle		Pectoralis minor and major muscles	
Medial brachial cutaneous nerve	Medial cord (T1)	Emerges and traverses axilla anterior to latissimus dorsi muscle, running posteromedial with axillary vein, piercing deep fascia to descend with basilic vein	Anterior and posterior branches		Anterior part of medial arm
Medial antebrachial cutaneous nerve	Medial cord (C8–T1)	Emerges medial to axillary artery, traverses axilla to pierce deep fascia supplying anterior arm, and continues on ulnar side of forearm with basilic vein	Anterior and posterior branches		Anterior arm, medial part of forearm
Ulnar nerve	Medial cord (C7–T1)	Emerges medial to axillary artery, continuing medial to brachial artery along medial head of triceps brachii muscle in groove for ulnar nerve between olecranon and medial epicondyle; enters forearm between heads of flexor carpi ulnaris; runs distally between flexor carpi ulnaris and flexor digitorum profundus, giving off dorsal branch before entering hand	Muscular, dorsal, palmar, superficial, and deep branches	Flexor carpi ulnaris, flexor digitorum profundus (medial half), adductor pollicis, hypothenar muscles, dorsal and palmar interosseous muscles, lumbrical muscles (medial two)	Medial part of palm and dorsum of hand, 5th finger and part of 4th
Median nerve	Medial and lateral cords (C6–T1)	Emerges and runs distally with brachial artery to enter forearm between heads of pronator teres; courses distally on deep surface of flexor digitorum superficialis to become superficial at flexor retinaculum of wrist; traverses carpal tunnel deep to flexor retinaculum of wrist	Anterior interosseous nerve, muscular, palmar, recurrent, and common palmar digital branches	Anterior compartment of forearm (*some exceptions*), lumbricals (lateral two), and thenar muscles (also see anterior interosseous nerve)	Lateral part of palm, thumb, 2nd and 3rd fingers, and part of 4th finger
Anterior interosseous nerve	Median nerve	At elbow runs distally with anterior interosseous artery along anterior surface of interosseous membrane of forearm		Flexor pollicis longus, pronator quadratus, flexor digitorum profundus (lateral half)	

MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT	DISTAL ATTACHMENT	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Abductor digiti minimi of hand	Hand	Pisiform bone, tendon of flexor carpi ulnaris	Medial surface of base of proximal phalanx of little finger (5th digit)	Ulnar nerve (deep branch)	Deep palmar branch of ulnar artery	Abducts little finger
Abductor pollicis brevis	Hand	Flexor retinaculum of wrist, tubercles of scaphoid and trapezium bones	Base of proximal phalanx of thumb	Median nerve (recurrent branch)	Superficial palmar branch of radial artery	Abducts thumb
Abductor pollicis longus	Posterior forearm	Posterior surfaces of ulna, radius, and interosseous membrane of forearm	Base of 1st metacarpal	Posterior interosseous nerve	Posterior interosseous artery	Abducts and extends thumb
Adductor pollicis	Hand	*Oblique head:* bases of 2nd and 3rd metacarpals, capitate and adjacent carpal bones *Transverse head:* anterior surface of 3rd metacarpal	Base of proximal phalanx of thumb	Ulnar nerve (deep branch)	Deep palmar arch	Adducts thumb
Anconeus m.	Posterior forearm	Posterior surface of lateral epicondyle of humerus	Lateral surface of olecranon, posterior surface of proximal ulna	Radial nerve	Deep brachial artery	Assists triceps brachii m. in extending elbow
Biceps brachii m.	Anterior arm	*Long head:* supraglenoid tubercle of scapula *Short head:* coracoid process of scapula	Radial tuberosity, fascia of forearm (via bicipital aponeurosis)	Musculocutaneous nerve	Brachial artery	Flexes and supinates forearm
Brachialis m.	Anterior arm	Distal half of anterior surface of humerus	Coronoid process and tuberosity of ulna	Musculocutaneous and radial nerves	Radial recurrent and brachial arteries	Flexes forearm
Brachioradialis m.	Posterior forearm	Proximal two thirds of lateral supracondylar ridge of humerus	Lateral surface of distal end of radius	Radial nerve	Radial recurrent artery	Weak flexion of forearm when forearm is in midpronation
Coracobrachialis m.	Anterior arm	Coracoid process of scapula	Middle one third of medial surface of humerus	Musculocutaneous nerve	Brachial artery	Flexes and adducts arm
Deltoid m.	Shoulder	*Clavicular part:* lateral one third of clavicle *Acromial part:* acromion *Spinous part:* spine of scapula	Deltoid tuberosity of humerus	Axillary nerve	Posterior circumflex humeral artery Deltoid branch of thoraco-acromial artery	*Clavicular part:* flexes and medially rotates arm *Acromial part:* abducts arm beyond initial 15 degrees done by supraspinatus m. *Spinous part:* extends and laterally rotates arm
Dorsal interosseous mm. of hand	Hand	Facing surfaces of adjacent metacarpal bones	Base of proximal phalanges, and extensor expansions of digits 2–4	Ulnar nerve (deep branch)	Deep palmar arch	Abduct digits; flex digits at metacarpophalangeal joint and extend interphalangeal joints
Extensor carpi radialis brevis	Posterior forearm	Lateral epicondyle of humerus	Bases of 3rd and 2nd metacarpal bones	Radial nerve (deep branch)	Radial and radial recurrent arteries	Extends and abducts hand
Extensor carpi radialis longus	Posterior forearm	Distal one third of lateral supracondylar ridge of humerus	Base of 2nd metacarpal	Radial nerve	Radial and radial recurrent arteries	Extends and abducts hand

MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT	DISTAL ATTACHMENT	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Extensor carpi ulnaris	Posterior forearm	Lateral epicondyle of humerus, posterior border of ulna	Base of 5th metacarpal bone	Posterior interosseous nerve	Posterior interosseous artery	Extends and adducts hand
Extensor digiti minimi	Posterior forearm	Lateral epicondyle of humerus	Extensor expansion of little finger	Posterior interosseous nerve	Posterior interosseous artery	Extends 5th digit
Extensor digitorum	Posterior forearm	Lateral epicondyle of humerus	Extensor expansions of digits 2–5	Posterior interosseous nerve	Posterior interosseous artery	Extends medial four metacarpophalangeal joints, assists in wrist extension
Extensor indicis	Posterior forearm	Posterior surfaces of ulna and interosseous membrane of forearm	Extensor expansion of 2nd digit	Posterior interosseous nerve	Posterior interosseous artery	Extends 2nd digit and helps extend hand
Extensor pollicis brevis	Posterior forearm	Posterior surfaces of radius and interosseous membrane of forearm	Dorsal surface of base of proximal phalanx of thumb	Posterior interosseous nerve	Posterior interosseous artery	Extends proximal phalanx of thumb
Extensor pollicis longus	Posterior forearm	Posterior surfaces of middle one third of ulna and interosseous membrane of forearm	Dorsal surface of base of distal phalanx of thumb	Posterior interosseous nerve	Posterior interosseous artery	Extends distal phalanx of thumb
Flexor carpi radialis	Anterior forearm	Medial epicondyle of humerus	Base of 2nd metacarpal bone	Median nerve	Radial artery	Flexes and abducts hand
Flexor carpi ulnaris	Anterior forearm	*Superficial head:* medial epicondyle of humerus *Deep head:* olecranon and posterior border of ulna	Pisiform bone, hook of hamate bone, base of 5th metacarpal bone	Ulnar nerve	Posterior ulnar recurrent artery	Flexes and adducts hand
Flexor digiti minimi of hand	Hand	Flexor retinaculum of wrist, hook of hamate bone	Medial surface of base of proximal phalanx of little finger	Ulnar nerve (deep branch)	Deep palmar branch of ulnar artery	Flexes proximal phalanx of little finger
Flexor digitorum profundus	Anterior forearm	Medial and anterior surfaces of proximal three fourths of ulna, interosseous membrane of forearm	Palmar surface of base of distal phalanges of digits 2–5	Medial part: ulnar nerve Lateral part: median nerve	Anterior interosseous and ulnar arteries	Flexes distal phalanges of medial four digits, assists with flexion of hand
Flexor digitorum superficialis	Anterior forearm	*Humeroulnar head:* medial epicondyle of humerus, coronoid process of ulna, ulnar collateral ligament *Radial head:* anterior surface of proximal radius	Bodies of middle phalanges of medial four digits	Median nerve	Ulnar and radial arteries	Flexes middle and proximal phalanges of medial four digits, flexes hand
Flexor pollicis brevis	Hand	*Superficial head:* flexor retinaculum, tubercle of trapezium bone *Deep head:* trapezoid and capitate bones	Lateral surface of base of proximal phalanx of thumb	Superficial head: median nerve (recurrent branch) Deep head: ulnar nerve (deep branch)	Superficial palmar branch of radial artery	Flexes proximal phalanx of thumb
Flexor pollicis longus	Anterior forearm	Anterior surfaces of radius and interosseous membrane	Palmar base of distal phalanx of thumb	Anterior interosseous nerve	Anterior interosseous artery	Flexes thumb

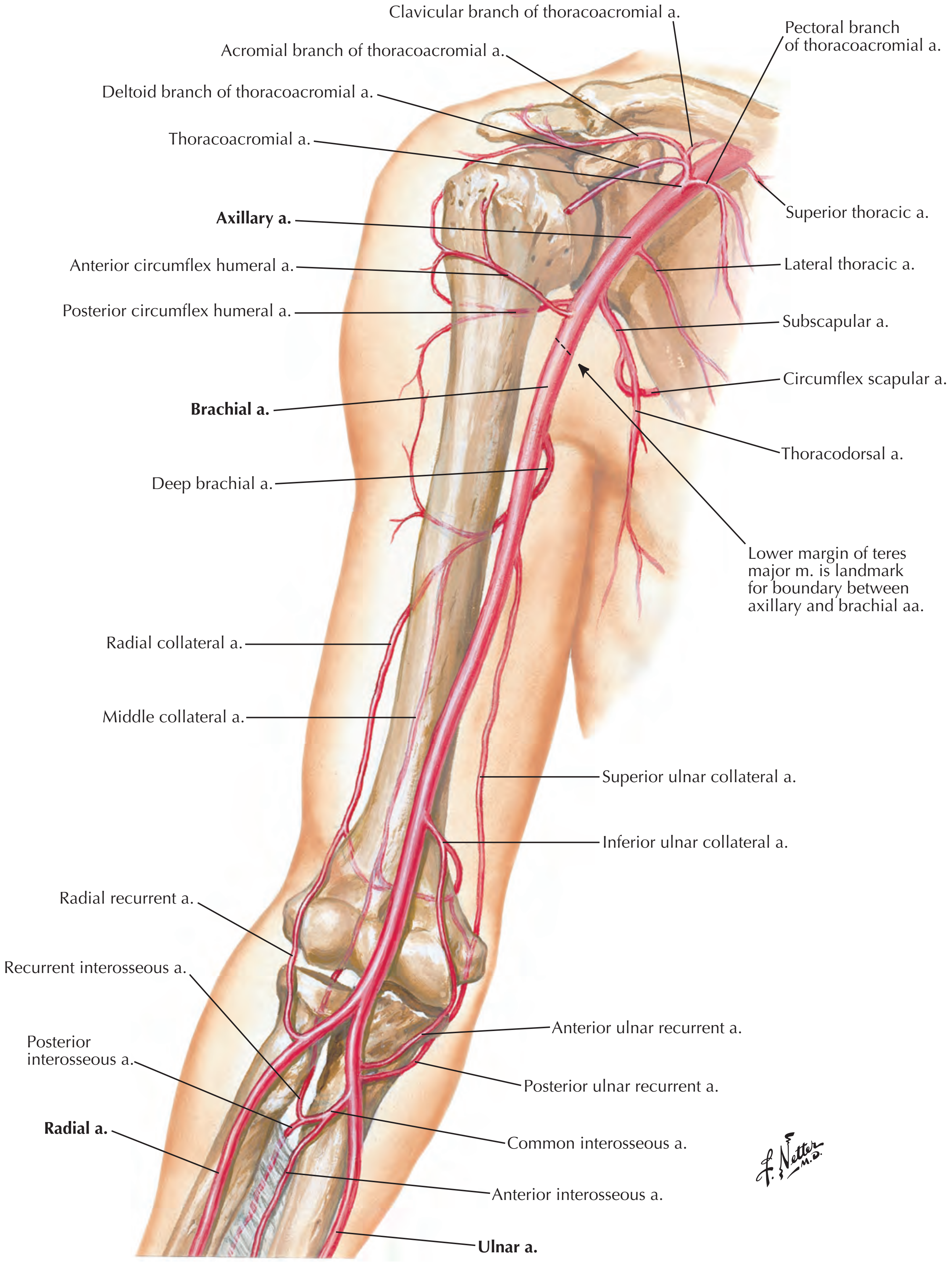
Continued

MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT	DISTAL ATTACHMENT	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Infraspinatus m.	Shoulder	Infraspinous fossa of scapula, infraspinatus fascia	Greater tubercle of humerus	Suprascapular nerve	Suprascapular artery	Lateral rotation of arm
Lumbrical mm. of hand	Hand	Tendons of flexor digitorum profundus	Lateral sides of extensor expansions of digits 2–5	*Lateral two:* median nerve (digital branches) *Medial two:* ulnar nerve (deep branch)	Superficial and deep palmar arches	Extend digits, flex metacarpophalangeal joints
Opponens digiti minimi m. of hand	Hand	Flexor retinaculum of wrist, hook of hamate bone	Palmar surface of 5th metacarpal bone	Ulnar nerve (deep branch)	Deep palmar branch of ulnar artery	Draws 5th metacarpal bone anteriorly and rotates it to face thumb
Opponens pollicis m.	Hand	Flexor retinaculum of wrist, tubercle of trapezium bone	Lateral surface of 1st metacarpal bone	Median nerve (recurrent branch)	Superficial palmar branch of radial artery	Draws 1st metacarpal forward and rotates it medially
Palmar interosseous mm.	Hand	Palmar surfaces of metacarpal bones 2, 4, and 5	Bases of proximal phalanges and extensor expansions of digits 2, 4, and 5	Ulnar nerve (deep branch)	Deep palmar arch	Adduct digits; flex digits and extend interphalangeal joints
Palmaris brevis m.	Hand	Palmar aponeurosis, flexor retinaculum	Skin of medial border of palm	Ulnar nerve (superficial branch)	Superficial palmar arch	Deepens hollow of hand, assists grip
Palmaris longus m.	Anterior forearm	Medial epicondyle of humerus	Distal half of flexor retinaculum of wrist, palmar aponeurosis	Median nerve	Posterior ulnar recurrent artery	Flexes hand and tenses palmar aponeurosis
Pronator quadratus	Anterior forearm	Distal one fourth of anterior surface of ulna	Distal one fourth of anterior surface of radius	Anterior interosseous nerve	Anterior interosseous artery	Pronates forearm
Pronator teres	Anterior forearm	*Humeral head:* medial epicondyle of humerus *Ulnar head:* coronoid process of ulna	Middle part of lateral surface of radius	Median nerve	Anterior ulnar recurrent artery	Pronates forearm and flexes elbow
Subscapularis m.	Shoulder	Subscapular fossa	Lesser tubercle of humerus	Upper and lower subscapular nerves	Subscapular and lateral thoracic arteries	Medially rotates and adducts arm; helps hold humeral head in glenoid fossa
Supinator	Posterior forearm	Lateral epicondyle of humerus, radial collateral and annular ligaments, supinator fossa, and crest of ulna	Lateral, posterior, and anterior surfaces of proximal one third of radius	Radial nerve	Radial recurrent and posterior interosseous arteries	Supinates forearm
Supraspinatus m.	Shoulder	Supraspinous fossa of scapula, supraspinatus fascia	Greater tubercle of humerus	Suprascapular nerve	Suprascapular artery	Initiates arm abduction
Teres major m.	Shoulder	Posterior surface of inferior angle of scapula	Medial lip of intertubercular sulcus of humerus	Lower subscapular nerve	Circumflex scapular artery	Adducts and medially rotates arm
Teres minor m.	Shoulder	Superior two-thirds of posterior surface of lateral border of scapula	Greater tubercle of humerus	Axillary nerve	Circumflex scapular artery	Laterally rotates arm

MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT	DISTAL ATTACHMENT	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Triceps brachii m.	Posterior arm	*Long head:* infraglenoid tubercle of scapula	Posterior surface of olecranon	Radial nerve	Deep brachial artery	Extends forearm; long head stabilizes head of abducted humerus and extends and adducts arm
		Lateral head: proximal half of posterior humerus				
		Medial head: distal two thirds of medial and posterior humerus				

Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.

Arteries of Arm and Proximal Forearm


Clavicular branch of thoracoacromial a.
Pectoral branch of thoracoacromial a.
Acromial branch of thoracoacromial a.
Deltoid branch of thoracoacromial a.
Thoracoacromial a.
Superior thoracic a.
Axillary a.
Anterior circumflex humeral a.
Lateral thoracic a.
Posterior circumflex humeral a.
Subscapular a.
Circumflex scapular a.
Brachial a.
Thoracodorsal a.
Deep brachial a.
Lower margin of teres major m. is landmark for boundary between axillary and brachial aa.
Radial collateral a.
Middle collateral a.
Superior ulnar collateral a.
Inferior ulnar collateral a.
Radial recurrent a.
Recurrent interosseous a.
Anterior ulnar recurrent a.
Posterior interosseous a.
Posterior ulnar recurrent a.
Radial a.
Common interosseous a.
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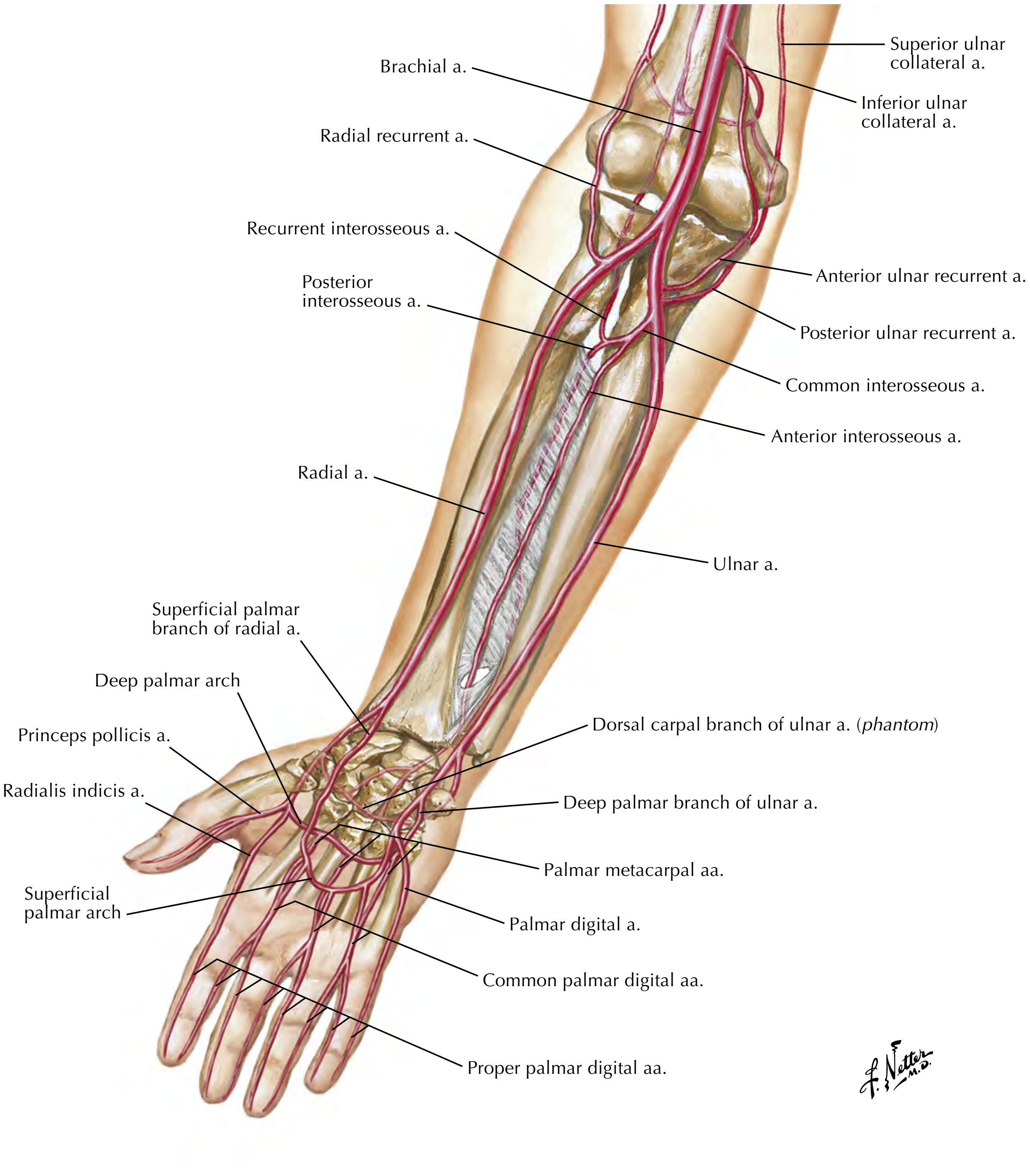
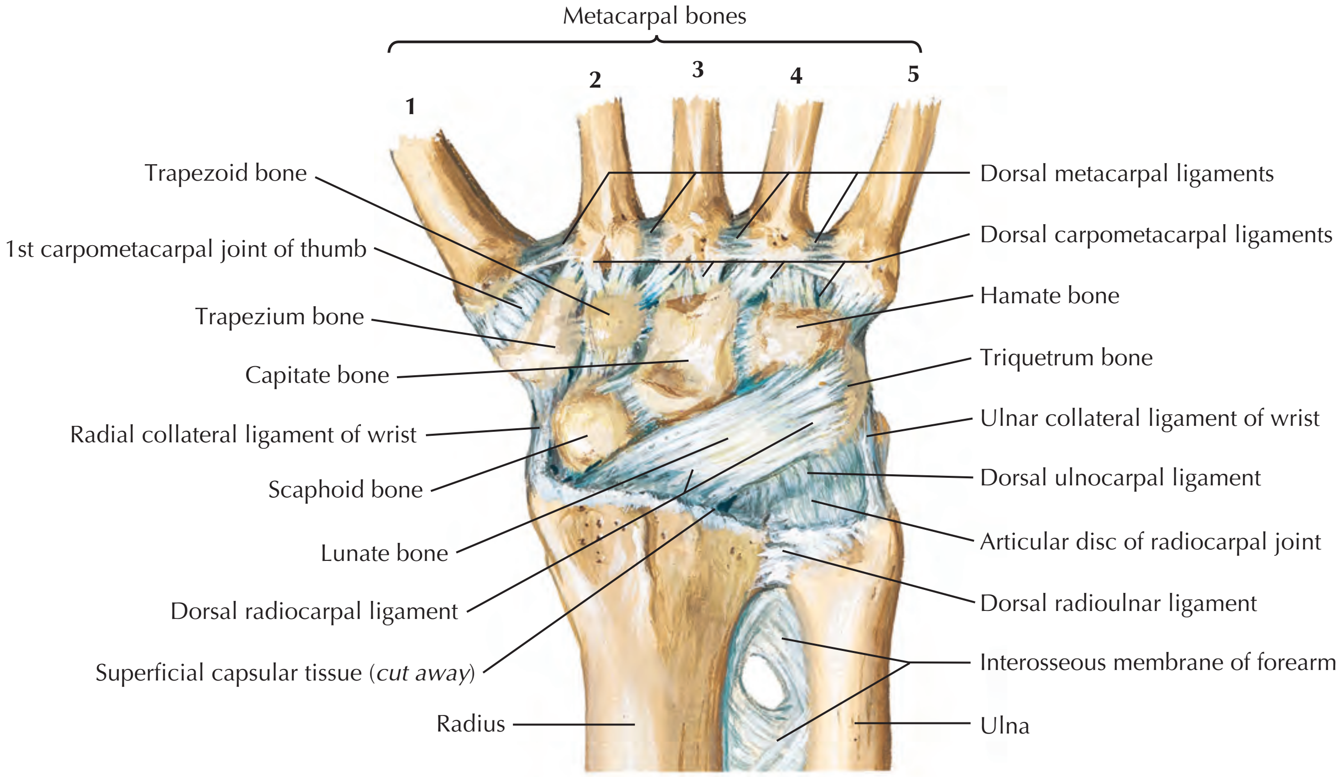
Anterior interosseous a.
Ulnar a.

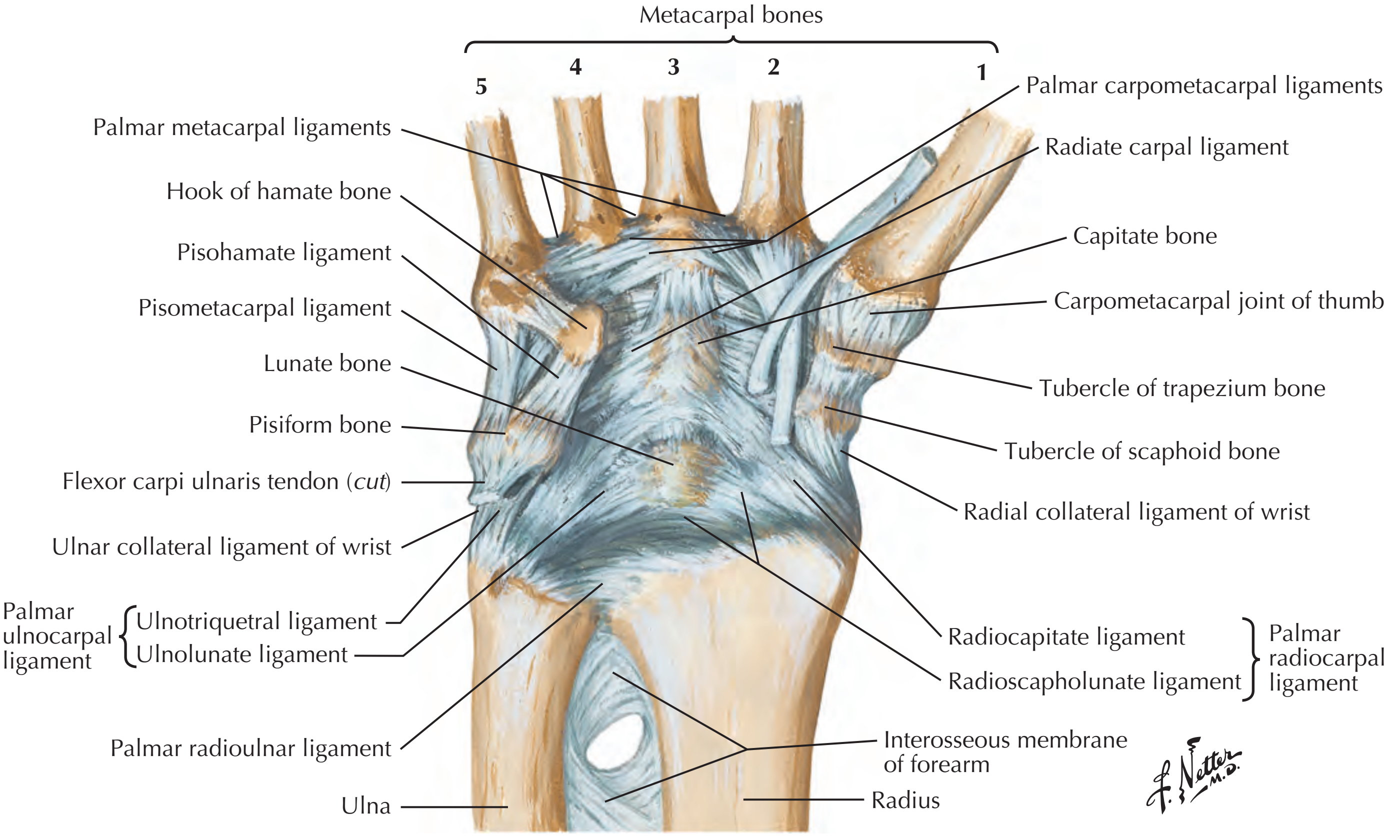
Arteries of Forearm and Hand


Superior ulnar collateral a.
Brachial a.
Inferior ulnar collateral a.
Radial recurrent a.
Recurrent interosseous a.
Anterior ulnar recurrent a.
Posterior interosseous a.
Posterior ulnar recurrent a.
Common interosseous a.
Anterior interosseous a.
Radial a.
Ulnar a.
Superficial palmar branch of radial a.
Deep palmar arch
Dorsal carpal branch of ulnar a. (*phantom*)
Princeps pollicis a.
Radialis indicis a.
Deep palmar branch of ulnar a.
Palmar metacarpal aa.
Superficial palmar arch
Palmar digital a.
Common palmar digital aa.
Proper palmar digital aa.

Posterior view


Metacarpal bones
1
2
3
4
5
Trapezoid bone
1st carpometacarpal joint of thumb
Trapezium bone
Capitate bone
Radial collateral ligament of wrist
Scaphoid bone
Lunate bone
Dorsal radiocarpal ligament
Superficial capsular tissue (*cut away*)
Radius
Dorsal metacarpal ligaments
Dorsal carpometacarpal ligaments
Hamate bone
Triquetrum bone
Ulnar collateral ligament of wrist
Dorsal ulnocarpal ligament
Articular disc of radiocarpal joint
Dorsal radioulnar ligament
Interosseous membrane of forearm
Ulna

Flexor retinaculum of wrist removed: anterior view


Metacarpal bones
5
4
3
2
1
Palmar metacarpal ligaments
Hook of hamate bone
Pisohamate ligament
Pisometacarpal ligament
Lunate bone
Pisiform bone
Flexor carpi ulnaris tendon (*cut*)
Ulnar collateral ligament of wrist
Palmar ulnocarpal ligament
Ulnotriquetral ligament
Ulnolunate ligament
Palmar radioulnar ligament
Ulna
Palmar carpometacarpal ligaments
Radiate carpal ligament
Capitate bone
Carpometacarpal joint of thumb
Tubercle of trapezium bone
Tubercle of scaphoid bone
Radial collateral ligament of wrist
Radiocapitate ligament
Radioscapholunate ligament
Palmar radiocarpal ligament
Interosseous membrane of forearm
Radius
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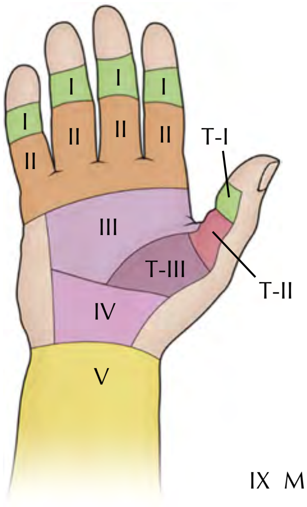
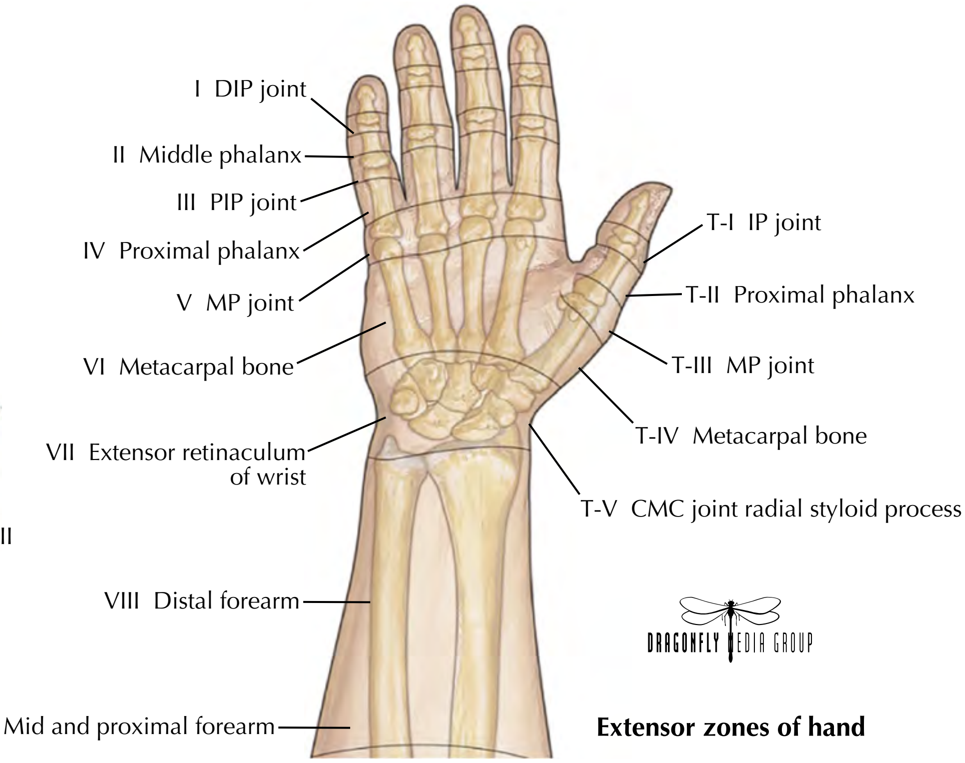
Flexor and Extensor Zones of Hand

Flexor zones of hand



I
I
I
I
II
II
II
II
T-I
III
T-III
T-II
IV
V

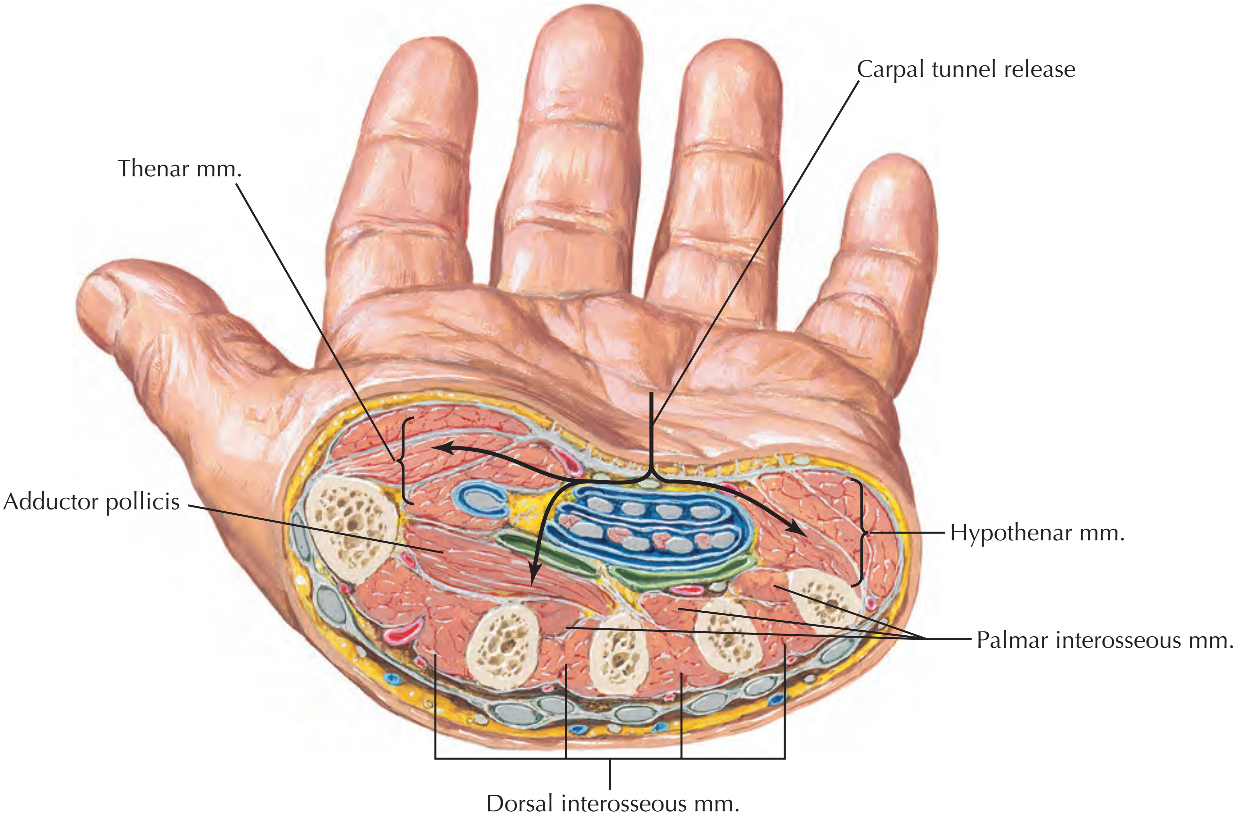
I FDS insertion
II Flexor sheath
III Lumbrical origin
IV Carpal tunnel
V Distal forearm
T-I Distal to IP joint
T-II Thumb MP joint to IP joint
T-III Thenar eminence

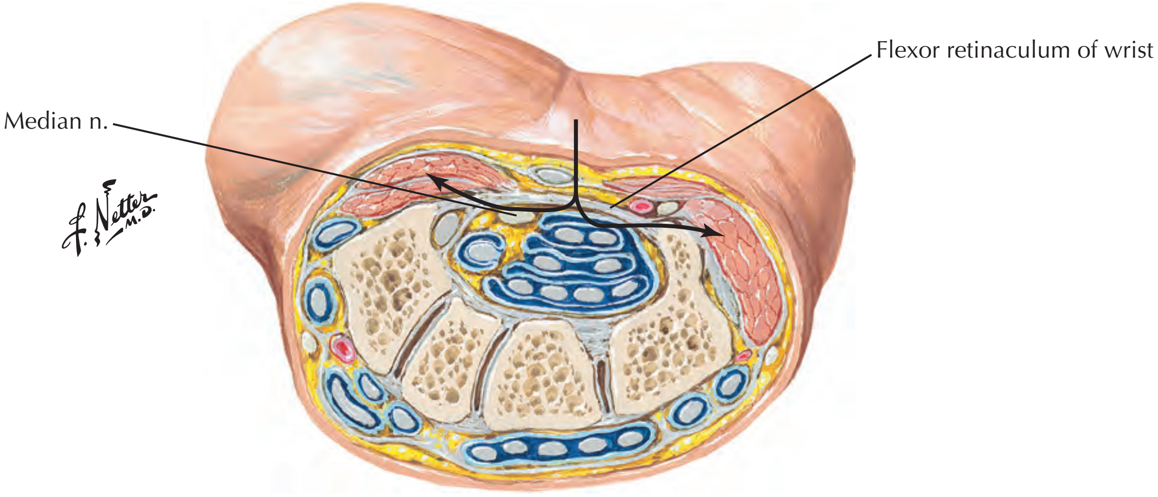


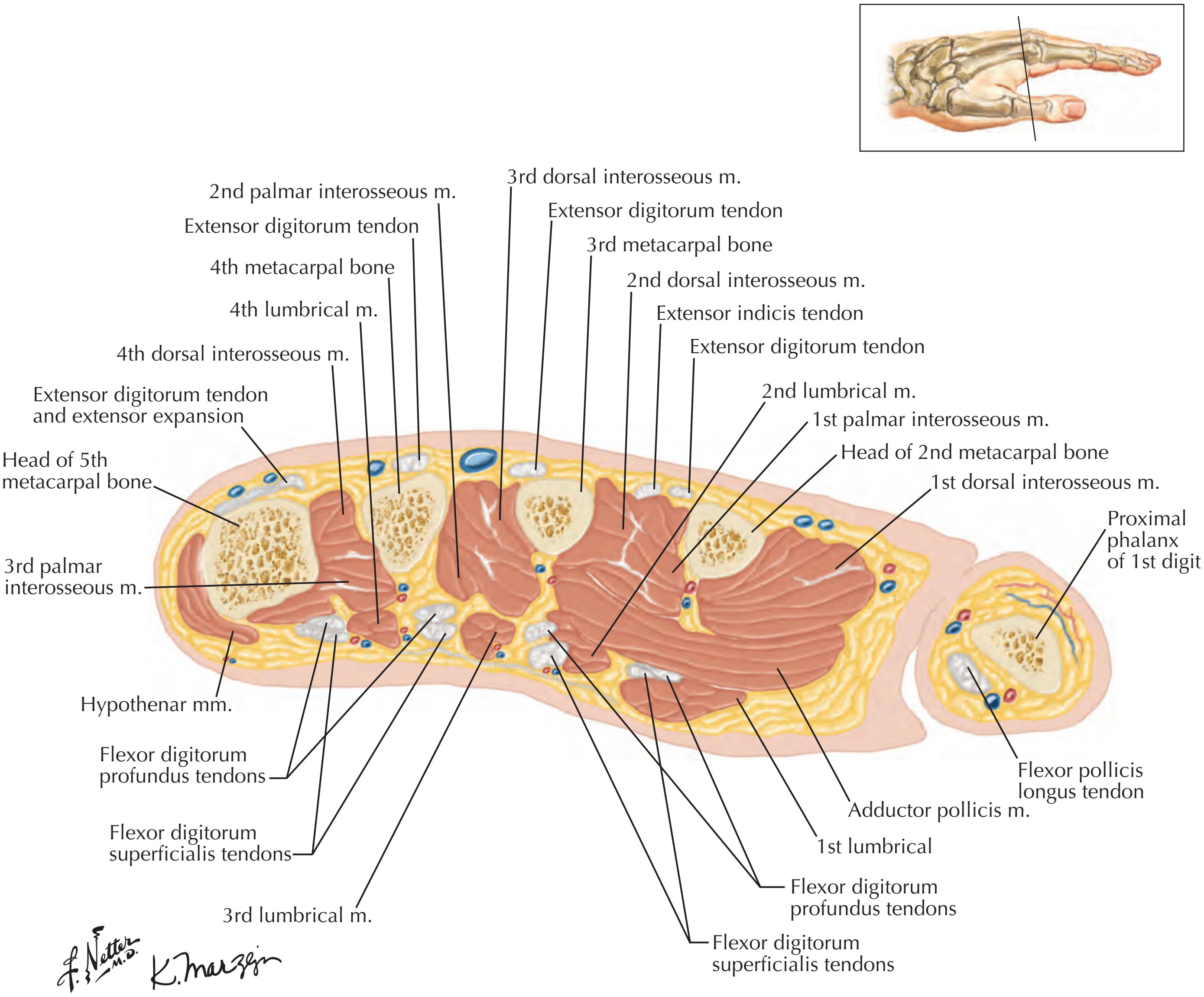
I DIP joint
II Middle phalanx
III PIP joint
IV Proximal phalanx
V MP joint
VI Metacarpal bone
VII Extensor retinaculum of wrist
VIII Distal forearm
IX Mid and proximal forearm
T-I IP joint
T-II Proximal phalanx
T-III MP joint
T-IV Metacarpal bone
T-V CMC joint radial styloid process
DRAGONFLY MEDIA GROUP

Extensor zones of hand

Cross Sections Through Metacarpal and Distal Carpal Bones


Carpal tunnel release
Thenar mm.
Adductor pollicis
Hypothenar mm.
Palmar interosseous mm.
Dorsal interosseous mm.

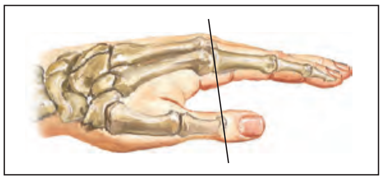

Flexor retinaculum of wrist
Median n.
F. Netter M.D.

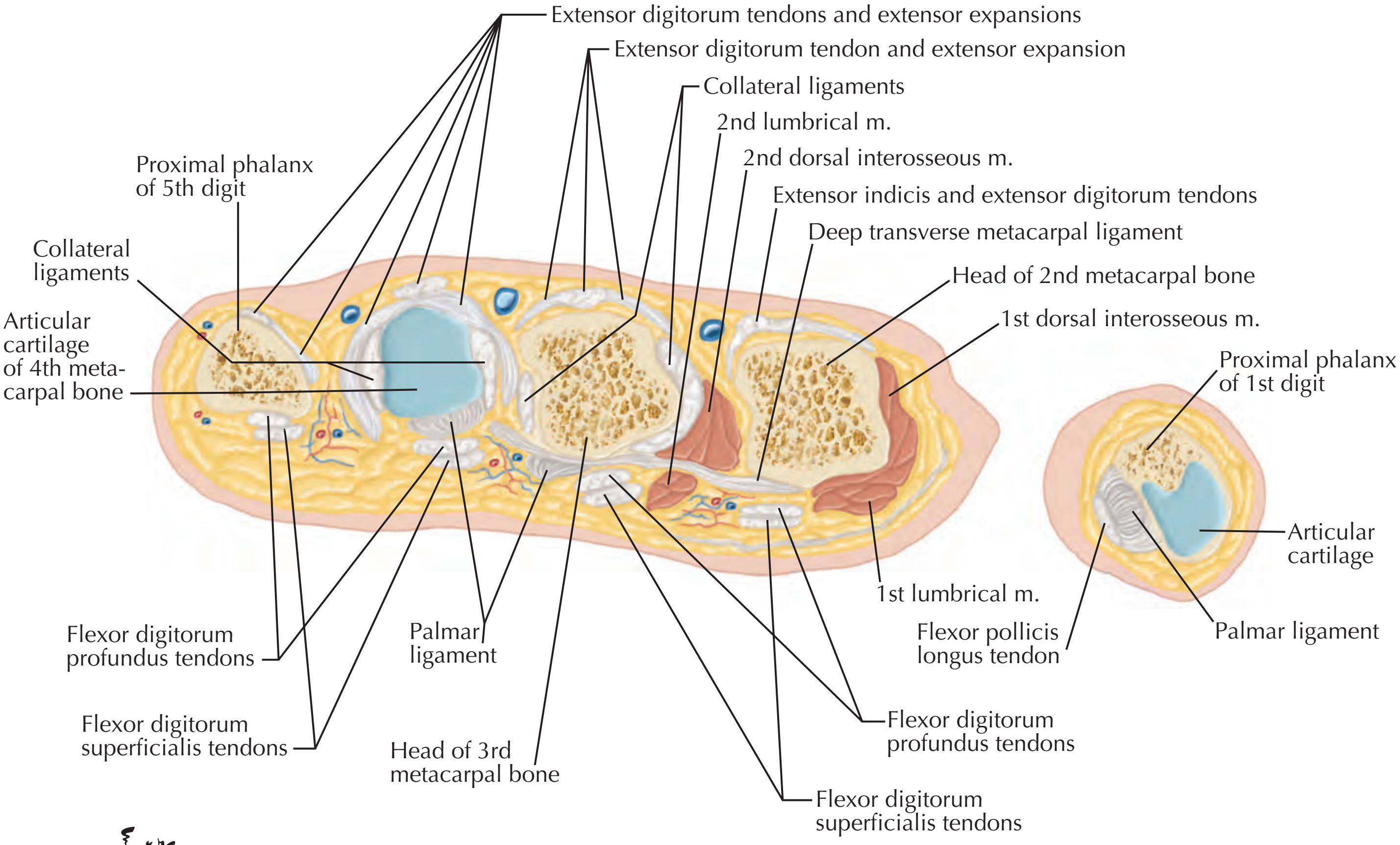


2nd palmar interosseous m.
Extensor digitorum tendon
4th metacarpal bone
4th lumbrical m.
4th dorsal interosseous m.
Extensor digitorum tendon and extensor expansion
Head of 5th metacarpal bone
3rd palmar interosseous m.
Hypothenar mm.
Flexor digitorum profundus tendons
Flexor digitorum superficialis tendons
3rd lumbrical m.
3rd dorsal interosseous m.
Extensor digitorum tendon
3rd metacarpal bone
2nd dorsal interosseous m.
Extensor indicis tendon
Extensor digitorum tendon
2nd lumbrical m.
1st palmar interosseous m.
Head of 2nd metacarpal bone
1st dorsal interosseous m.
Proximal phalanx of 1st digit
Flexor pollicis longus tendon
Adductor pollicis m.
1st lumbrical
Flexor digitorum profundus tendons
Flexor digitorum superficialis tendons

Cross Section of Hand: Axial View (Continued)

See also **Plate BP 101**




Extensor digitorum tendons and extensor expansions
Extensor digitorum tendon and extensor expansion
Collateral ligaments
2nd lumbrical m.
2nd dorsal interosseous m.
Extensor indicis and extensor digitorum tendons
Deep transverse metacarpal ligament
Head of 2nd metacarpal bone
1st dorsal interosseous m.
Proximal phalanx of 1st digit
Articular cartilage
Palmar ligament
Proximal phalanx of 5th digit
Collateral ligaments
Articular cartilage of 4th metacarpal bone
Flexor digitorum profundus tendons
Flexor digitorum superficialis tendons
Palmar ligament
Head of 3rd metacarpal bone
1st lumbrical m.
Flexor pollicis longus tendon
Flexor digitorum profundus tendons
Flexor digitorum superficialis tendons

LOWER LIMB

8

Surface Anatomy 491–494
Hip, Buttock, and Thigh 495–515
Knee 516–523
Leg 524–534
Ankle and Foot 535–549
Nerves 550–554
Regional Imaging 555–556
Structures with High Clinical Significance Tables 8.1–8.2
Nerves of Lumbosacral Plexus Tables 8.3–8.4
Muscles Tables 8.5–8.8
Electronic Bonus Plates BP 103–BP 112

ELECTRONIC BONUS PLATES

BP 103 Arteries of Knee and Foot

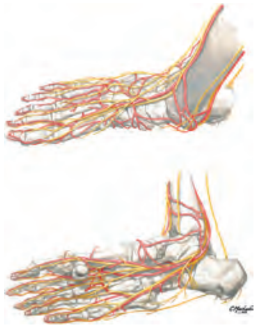
BP 104 Cross-Sectional Anatomy of Hip: Axial View

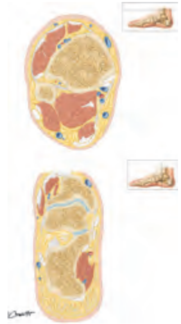
BP 105 Arteries of Thigh and Knee

BP 106 Leg: Serial Cross Sections

BP 107 Osteology of Knee

BP 108 Knee Radiograph: Lateral View


BP 109 Foot: Nerves and Arteries

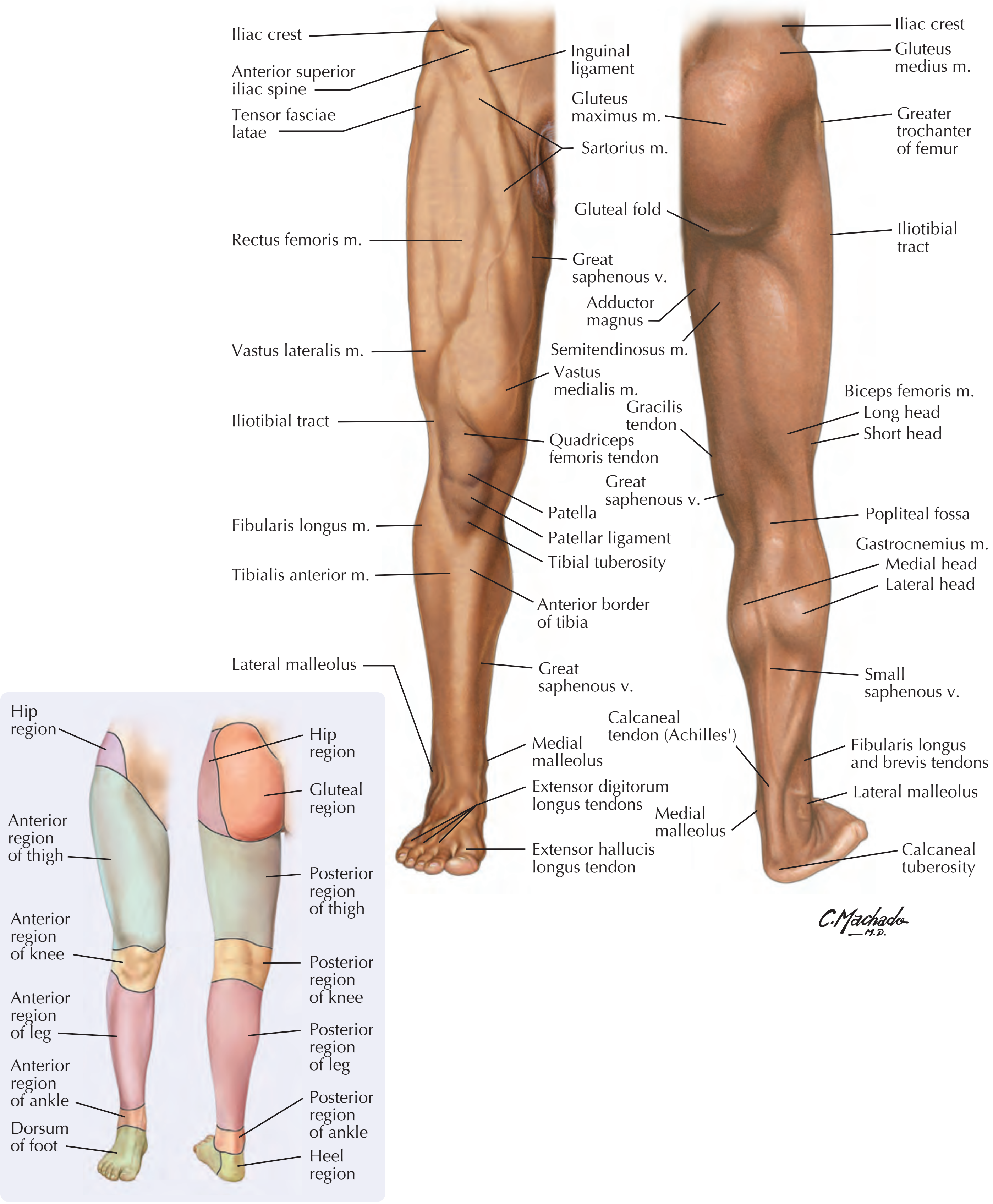

BP 110 Cross-Sectional Anatomy of Ankle and Foot

ELECTRONIC BONUS PLATES—*cont'd*

BP 111 Cross-Sectional Anatomy of Ankle and Foot (continued)

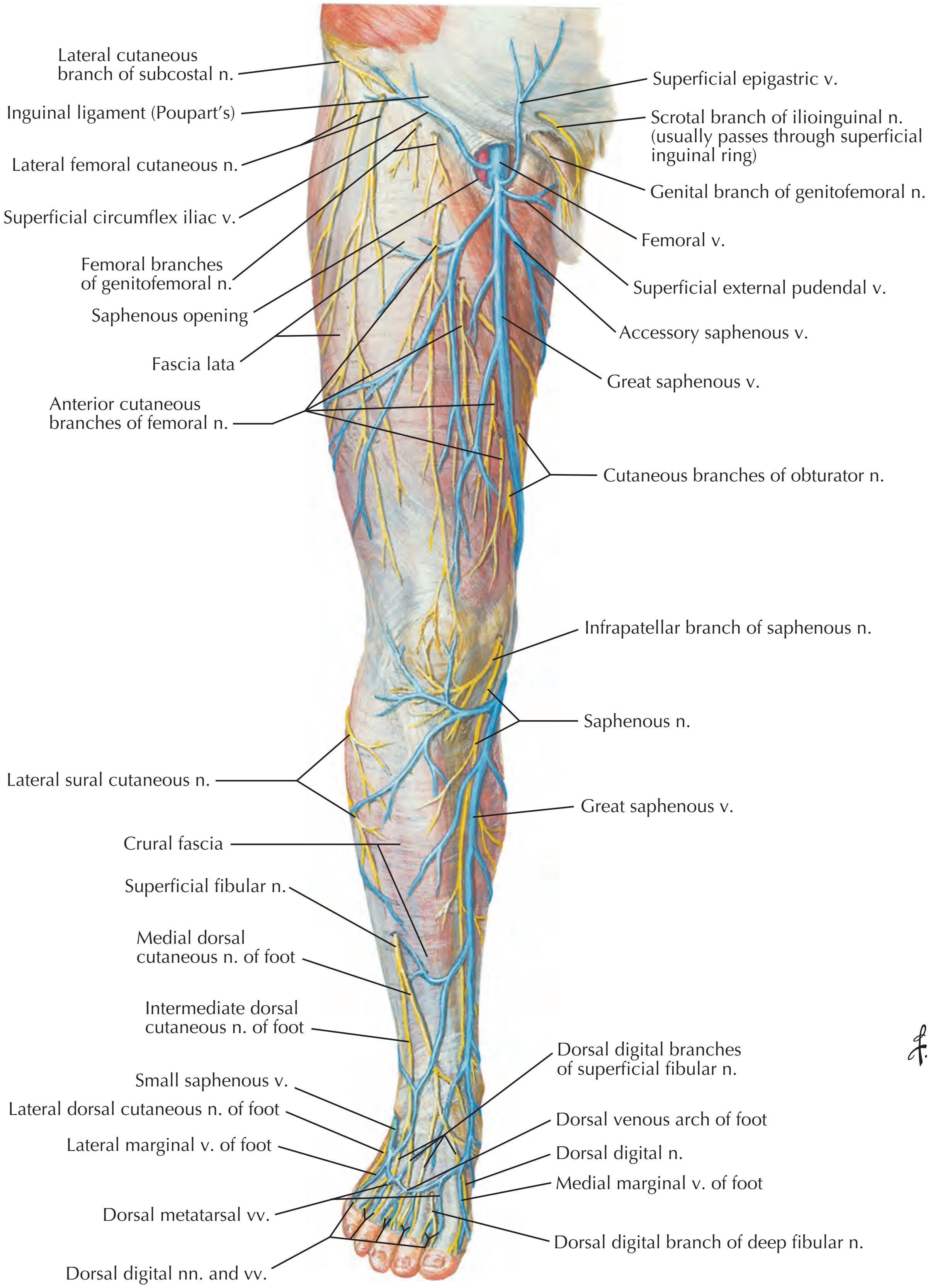
BP 112 Anatomy of Toenail

See also **Plates 5, 11, 492, 493**


Iliac crest
Anterior superior iliac spine
Tensor fasciae latae
Rectus femoris m.
Vastus lateralis m.
Iliotibial tract
Fibularis longus m.
Tibialis anterior m.
Lateral malleolus
Inguinal ligament
Gluteus maximus m.
Sartorius m.
Gluteal fold
Great saphenous v.
Adductor magnus
Semitendinosus m.
Vastus medialis m.
Gracilis tendon
Quadriceps femoris tendon
Great saphenous v.
Patella
Patellar ligament
Tibial tuberosity
Anterior border of tibia
Great saphenous v.
Calcaneal tendon (Achilles')
Medial malleolus
Extensor digitorum longus tendons
Medial malleolus
Extensor hallucis longus tendon
Iliac crest
Gluteus medius m.
Greater trochanter of femur
Iliotibial tract
Biceps femoris m.
Long head
Short head
Popliteal fossa
Gastrocnemius m.
Medial head
Lateral head
Small saphenous v.
Fibularis longus and brevis tendons
Lateral malleolus
Calcaneal tuberosity
Hip region
Anterior region of thigh
Anterior region of knee
Anterior region of leg
Anterior region of ankle
Dorsum of foot
Hip region
Gluteal region
Posterior region of thigh
Posterior region of knee
Posterior region of leg
Posterior region of ankle
Heel region

Superficial Veins of Lower Limb: Anterior View

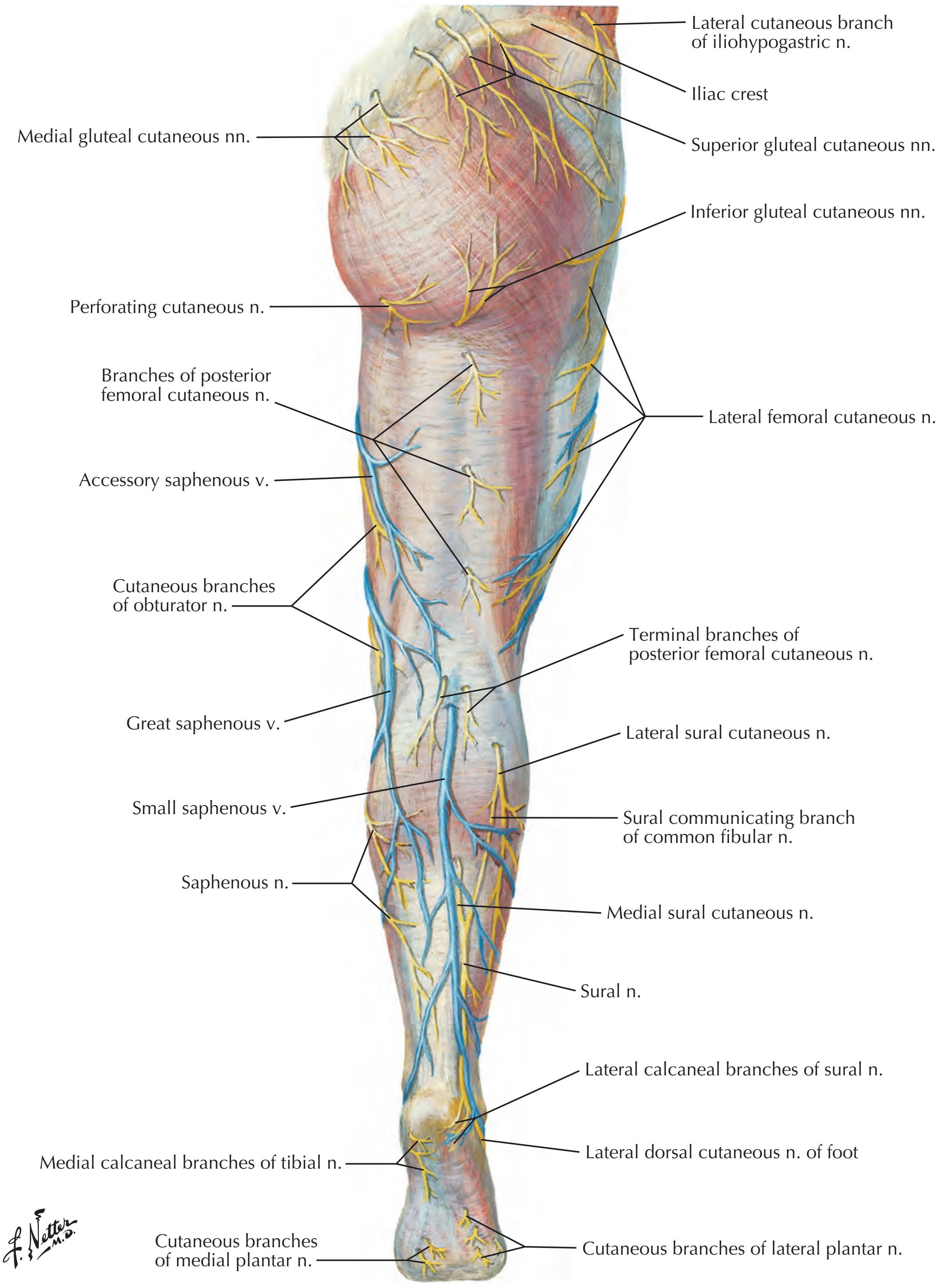
See also **Plates 523, 550, 551, 554**



Lateral cutaneous branch of subcostal n.
Inguinal ligament (Poupart's)
Lateral femoral cutaneous n.
Superficial circumflex iliac v.
Femoral branches of genitofemoral n.
Saphenous opening
Fascia lata
Anterior cutaneous branches of femoral n.
Superficial epigastric v.
Scrotal branch of ilioinguinal n. (usually passes through superficial inguinal ring)
Genital branch of genitofemoral n.
Femoral v.
Superficial external pudendal v.
Accessory saphenous v.
Great saphenous v.
Cutaneous branches of obturator n.
Infrapatellar branch of saphenous n.
Saphenous n.
Lateral sural cutaneous n.
Great saphenous v.
Crural fascia
Superficial fibular n.
Medial dorsal cutaneous n. of foot
Intermediate dorsal cutaneous n. of foot
Dorsal digital branches of superficial fibular n.
Small saphenous v.
Lateral dorsal cutaneous n. of foot
Lateral marginal v. of foot
Dorsal venous arch of foot
Dorsal digital n.
Medial marginal v. of foot
Dorsal metatarsal vv.
Dorsal digital branch of deep fibular n.
Dorsal digital nn. and vv.

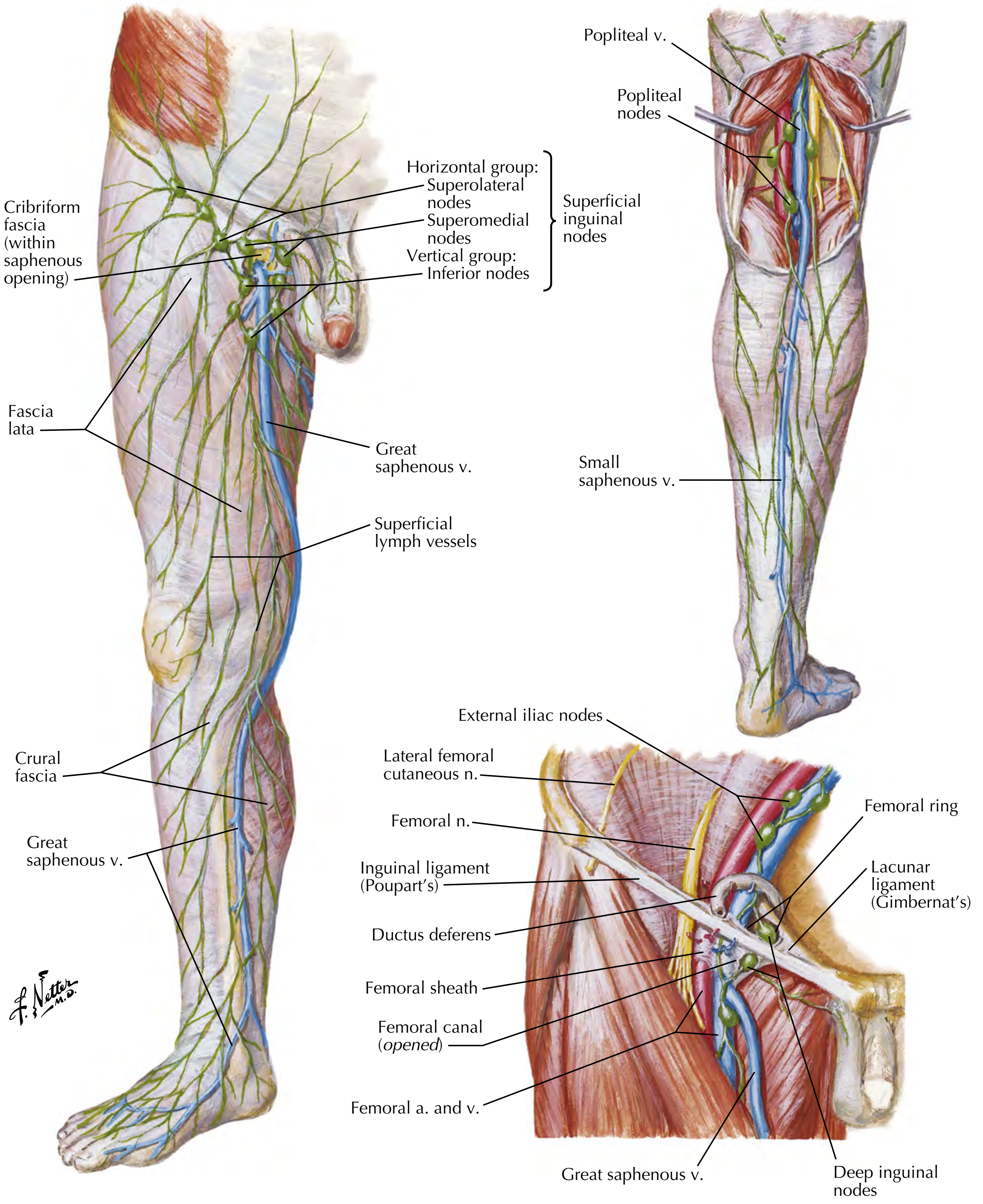
Superficial Veins of Lower Limb: Posterior View

See also **Plates 523, 552, 553**

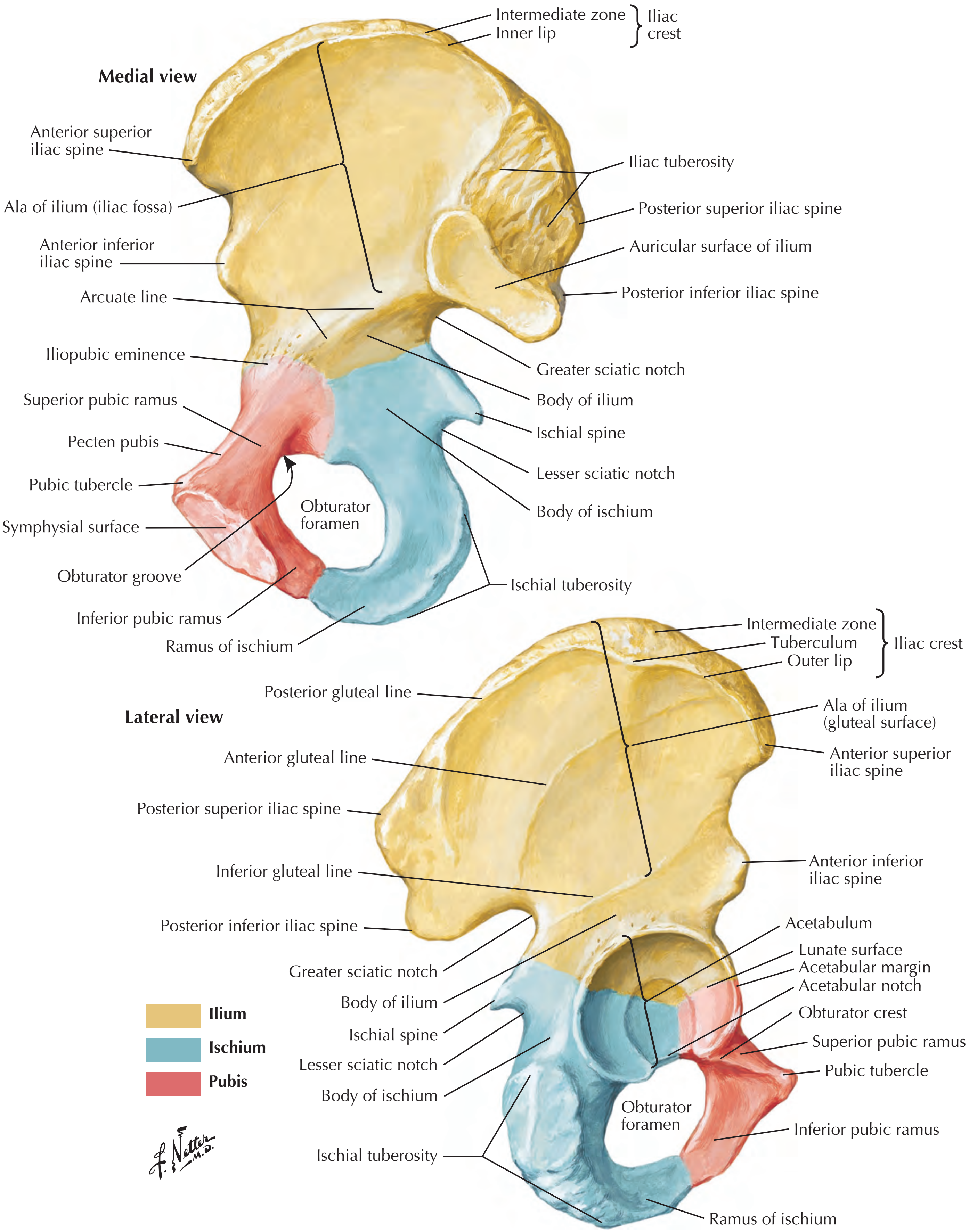

Lateral cutaneous branch of iliohypogastric n.
Iliac crest
Medial gluteal cutaneous nn.
Superior gluteal cutaneous nn.
Inferior gluteal cutaneous nn.
Perforating cutaneous n.
Branches of posterior femoral cutaneous n.
Lateral femoral cutaneous n.
Accessory saphenous v.
Cutaneous branches of obturator n.
Terminal branches of posterior femoral cutaneous n.
Great saphenous v.
Lateral sural cutaneous n.
Small saphenous v.
Sural communicating branch of common fibular n.
Saphenous n.
Medial sural cutaneous n.
Sural n.
Lateral calcaneal branches of sural n.
Lateral dorsal cutaneous n. of foot
Medial calcaneal branches of tibial n.
F. Netter M.D.
Cutaneous branches of medial plantar n.
Cutaneous branches of lateral plantar n.

Lymph Vessels and Lymph Nodes of Lower Limb

See also **Plates 409, 410**

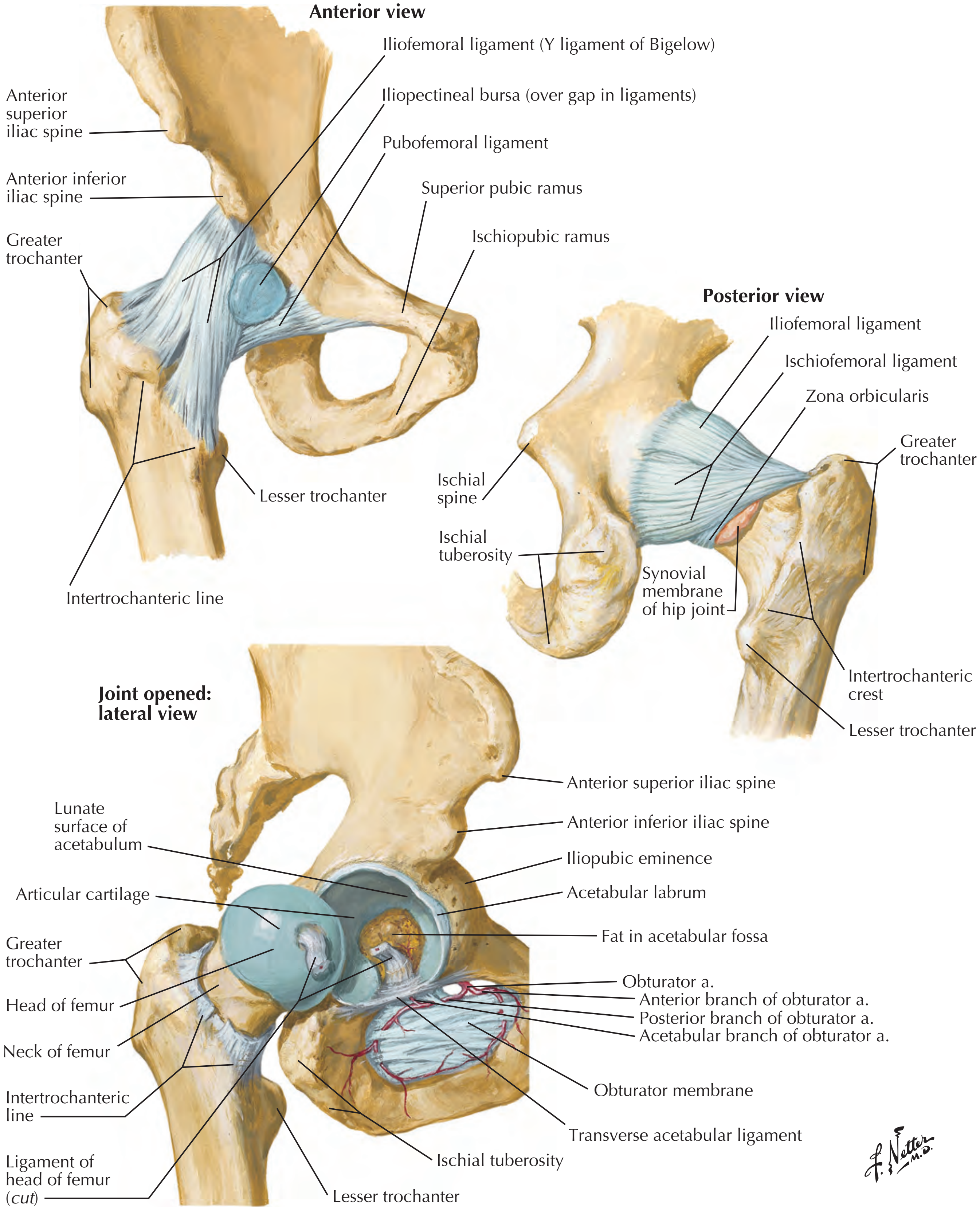


Cribriform fascia (within saphenous opening)
Horizontal group:
Superolateral nodes
Superomedial nodes
Vertical group:
Inferior nodes
Superficial inguinal nodes
Fascia lata
Great saphenous v.
Superficial lymph vessels
Crural fascia
Great saphenous v.
F. Netter M.D.
Popliteal v.
Popliteal nodes
Small saphenous v.
External iliac nodes
Lateral femoral cutaneous n.
Femoral n.
Inguinal ligament (Poupart's)
Ductus deferens
Femoral sheath
Femoral canal (*opened*)
Femoral a. and v.
Great saphenous v.
Femoral ring
Lacunar ligament (Gimbernat's)
Deep inguinal nodes


Medial view
Intermediate zone
Inner lip
Iliac crest
Anterior superior iliac spine
Ala of ilium (iliac fossa)
Anterior inferior iliac spine
Arcuate line
Iliopubic eminence
Superior pubic ramus
Pecten pubis
Pubic tubercle
Symphysial surface
Obturator groove
Inferior pubic ramus
Ramus of ischium
Iliac tuberosity
Posterior superior iliac spine
Auricular surface of ilium
Posterior inferior iliac spine
Greater sciatic notch
Body of ilium
Ischial spine
Lesser sciatic notch
Body of ischium
Obturator foramen
Ischial tuberosity
Lateral view
Intermediate zone
Tuberculum
Outer lip
Iliac crest
Posterior gluteal line
Ala of ilium (gluteal surface)
Anterior gluteal line
Anterior superior iliac spine
Posterior superior iliac spine
Inferior gluteal line
Anterior inferior iliac spine
Posterior inferior iliac spine
Acetabulum
Lunate surface
Acetabular margin
Acetabular notch
Greater sciatic notch
Body of ilium
Obturator crest
Ischial spine
Superior pubic ramus
Lesser sciatic notch
Pubic tubercle
Body of ischium
Obturator foramen
Inferior pubic ramus
Ischial tuberosity
Ramus of ischium
Ilium
Ischium
Pubis

Hip Joint

See also **Plates 353, 357, BP 11**



Anterior view

Iliofemoral ligament (Y ligament of Bigelow)
Iliopectineal bursa (over gap in ligaments)
Pubofemoral ligament
Superior pubic ramus
Ischiopubic ramus
Anterior superior iliac spine
Anterior inferior iliac spine
Greater trochanter
Lesser trochanter
Intertrochanteric line

Posterior view

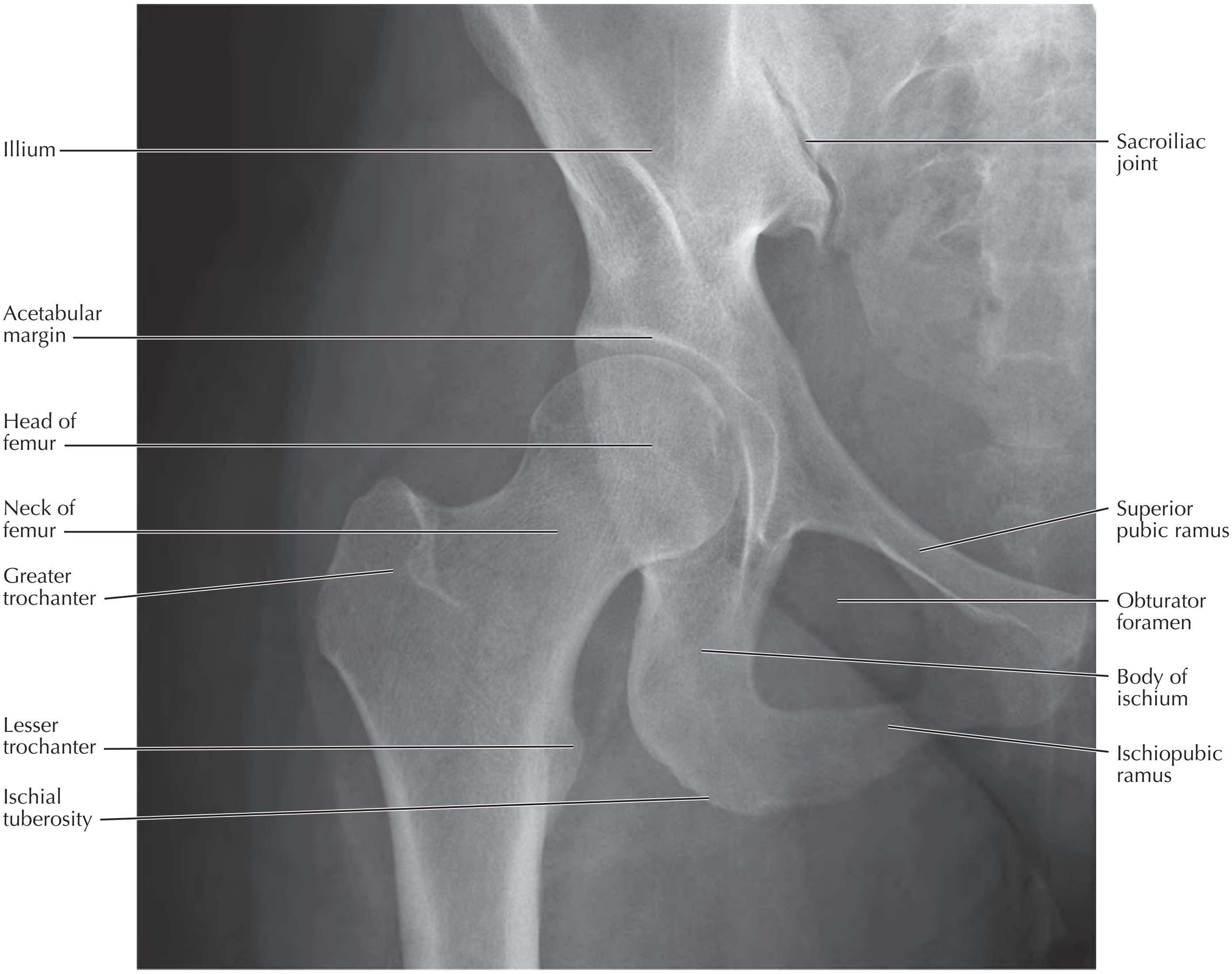
Iliofemoral ligament
Ischiofemoral ligament
Zona orbicularis
Greater trochanter
Ischial spine
Ischial tuberosity
Synovial membrane of hip joint
Intertrochanteric crest
Lesser trochanter

Joint opened: lateral view

Lunate surface of acetabulum
Articular cartilage
Greater trochanter
Head of femur
Neck of femur
Intertrochanteric line
Ligament of head of femur (*cut*)
Anterior superior iliac spine
Anterior inferior iliac spine
Iliopubic eminence
Acetabular labrum
Fat in acetabular fossa
Obturator a.
Anterior branch of obturator a.
Posterior branch of obturator a.
Acetabular branch of obturator a.
Obturator membrane
Transverse acetabular ligament
Ischial tuberosity
Lesser trochanter

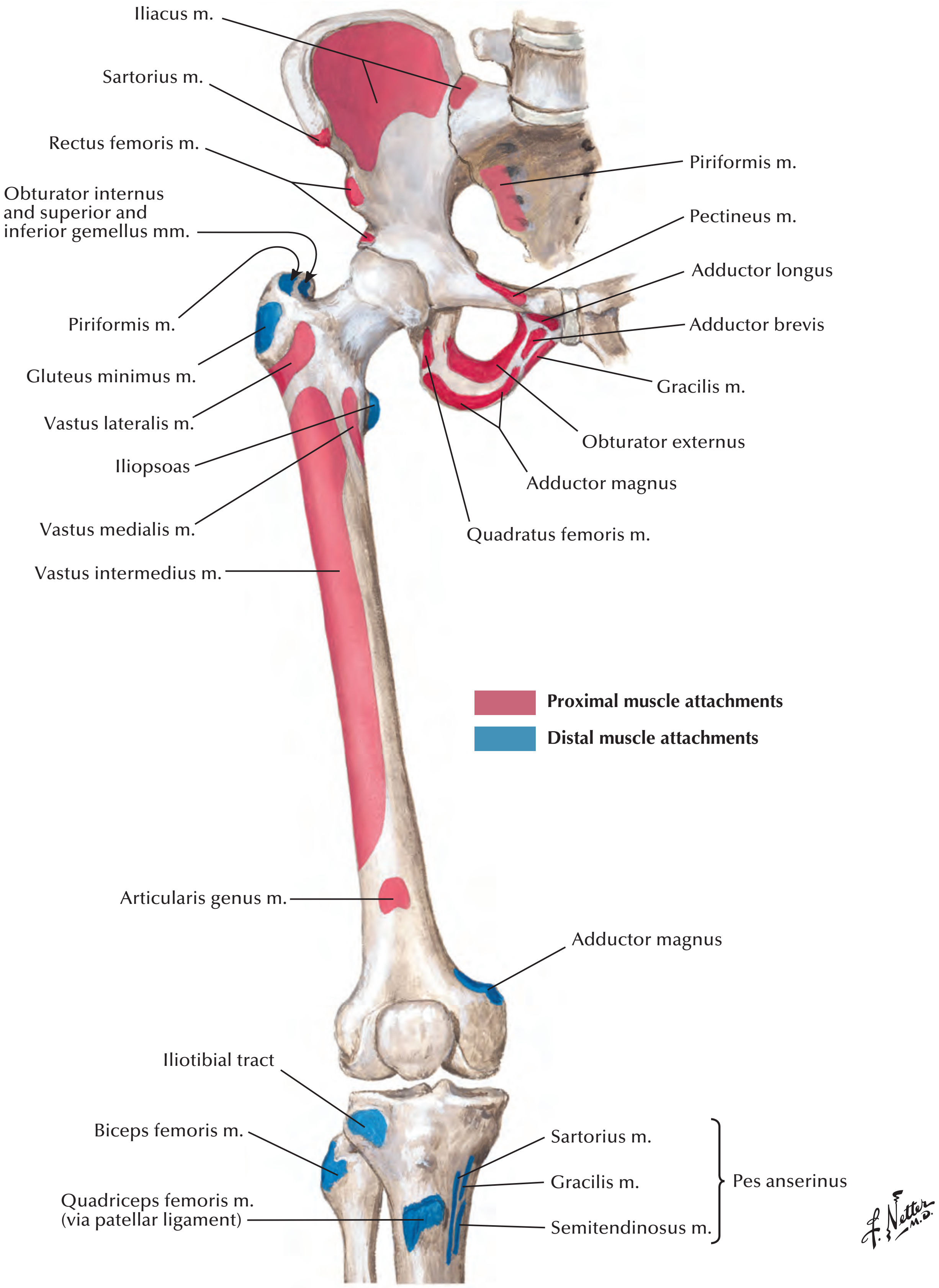
Hip Joint: Anteroposterior Radiograph

See also **Plates 354, 496, 498**


Illium
Acetabular margin
Head of femur
Neck of femur
Greater trochanter
Lesser trochanter
Ischial tuberosity
Sacroiliac joint
Superior pubic ramus
Obturator foramen
Body of ischium
Ischiopubic ramus

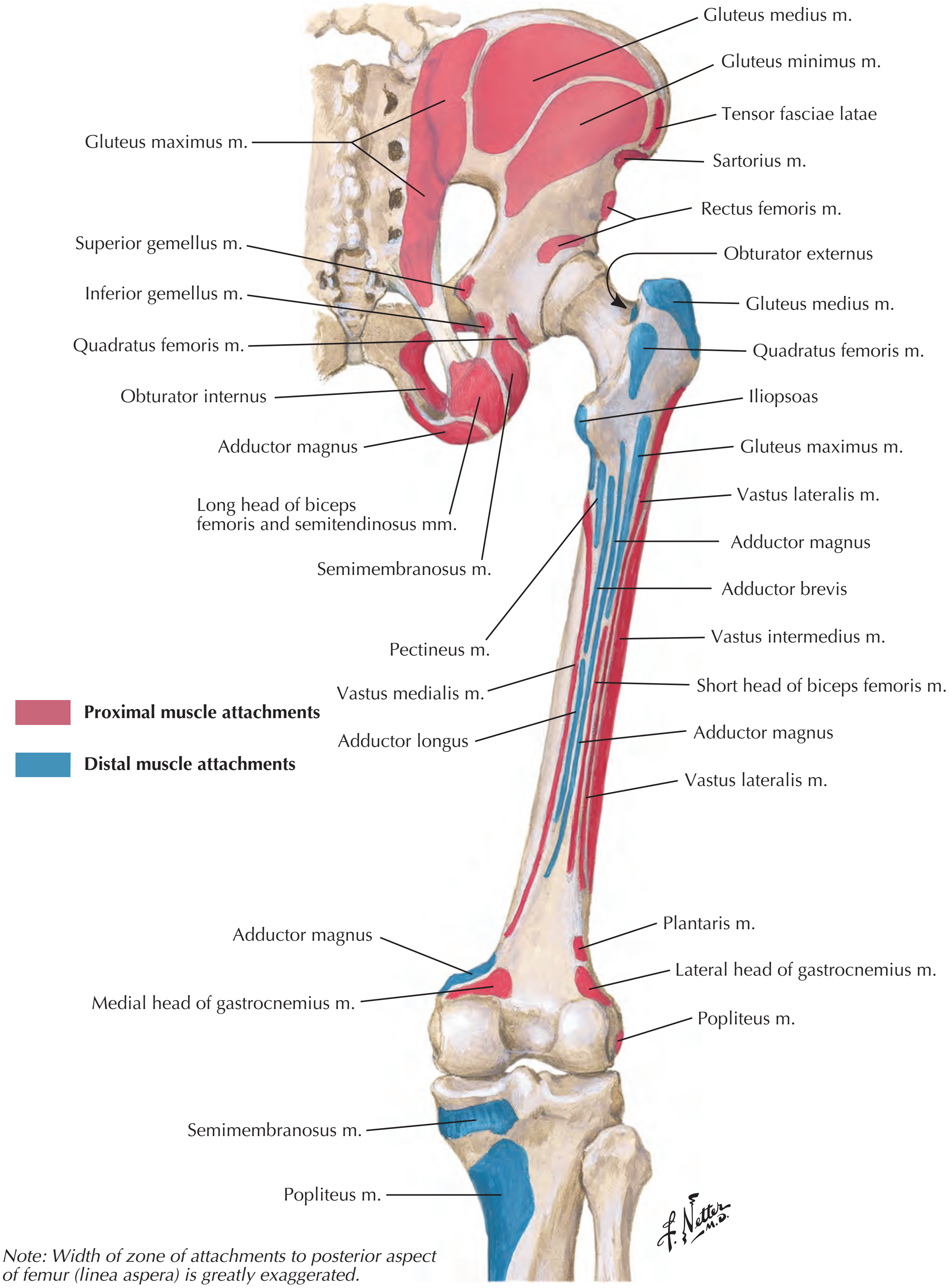
Attachments of Muscles of Hip and Thigh: Anterior View

See also **Plates 497, 555**


Iliacus m.
Sartorius m.
Rectus femoris m.
Obturator internus and superior and inferior gemellus mm.
Piriformis m.
Gluteus minimus m.
Vastus lateralis m.
Iliopsoas
Vastus medialis m.
Vastus intermedius m.
Piriformis m.
Pectineus m.
Adductor longus
Adductor brevis
Gracilis m.
Obturator externus
Adductor magnus
Quadratus femoris m.
🟥 Proximal muscle attachments
🟦 Distal muscle attachments
Articularis genus m.
Adductor magnus
Iliotibial tract
Biceps femoris m.
Quadriceps femoris m. (via patellar ligament)
Sartorius m.
Gracilis m.
Semitendinosus m.
Pes anserinus

Attachments of Muscles of Hip and Thigh: Posterior View

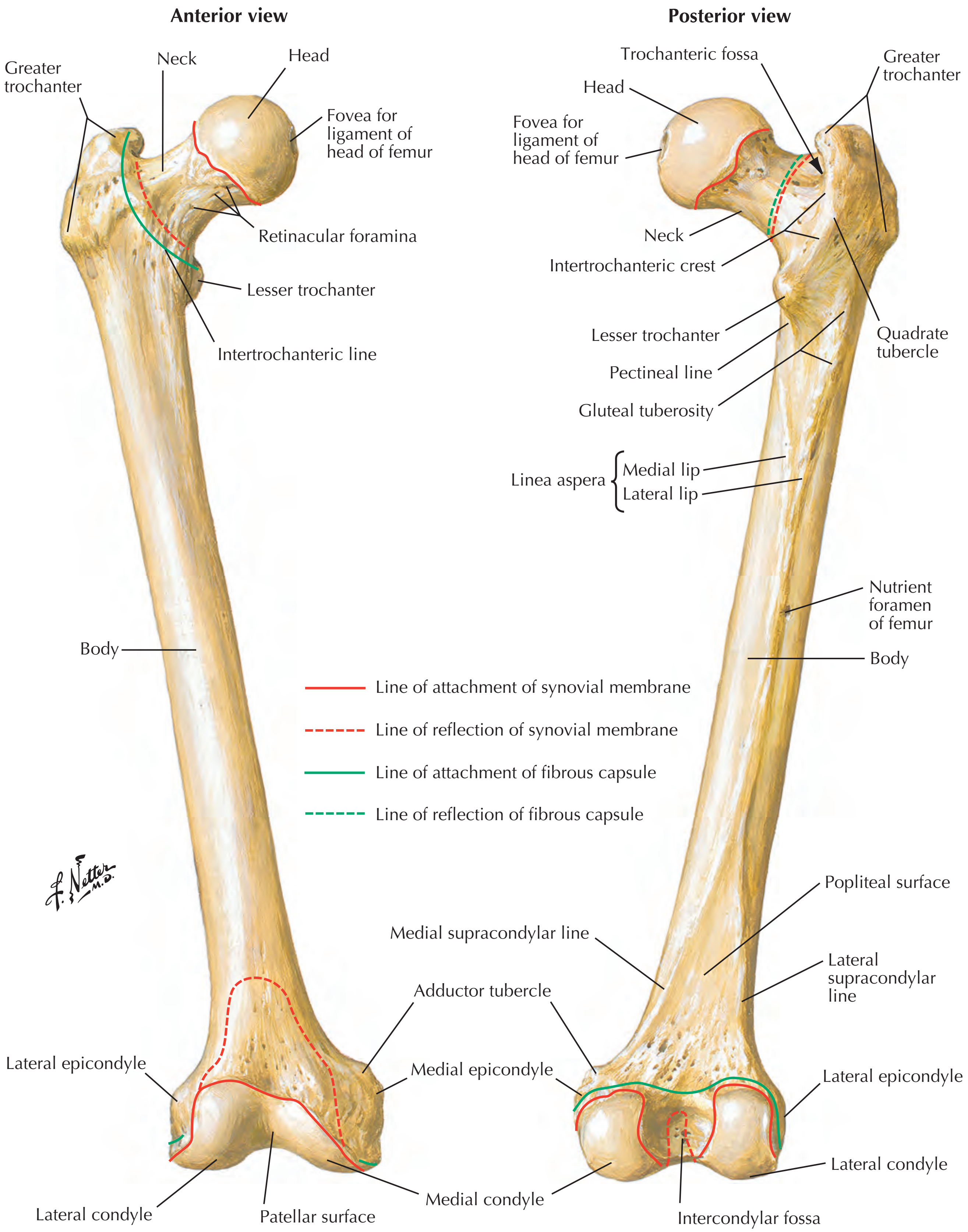
See also **Plate 497**


Gluteus medius m.
Gluteus minimus m.
Tensor fasciae latae
Sartorius m.
Rectus femoris m.
Obturator externus
Gluteus medius m.
Quadratus femoris m.
Iliopsoas
Gluteus maximus m.
Vastus lateralis m.
Adductor magnus
Adductor brevis
Vastus intermedius m.
Short head of biceps femoris m.
Adductor magnus
Vastus lateralis m.
Plantaris m.
Lateral head of gastrocnemius m.
Popliteus m.
Gluteus maximus m.
Superior gemellus m.
Inferior gemellus m.
Quadratus femoris m.
Obturator internus
Adductor magnus
Long head of biceps femoris and semitendinosus mm.
Semimembranosus m.
Pectineus m.
Vastus medialis m.
Adductor longus
Adductor magnus
Medial head of gastrocnemius m.
Semimembranosus m.
Popliteus m.
🟥 Proximal muscle attachments
🟦 Distal muscle attachments

Note: Width of zone of attachments to posterior aspect of femur (linea aspera) is greatly exaggerated.

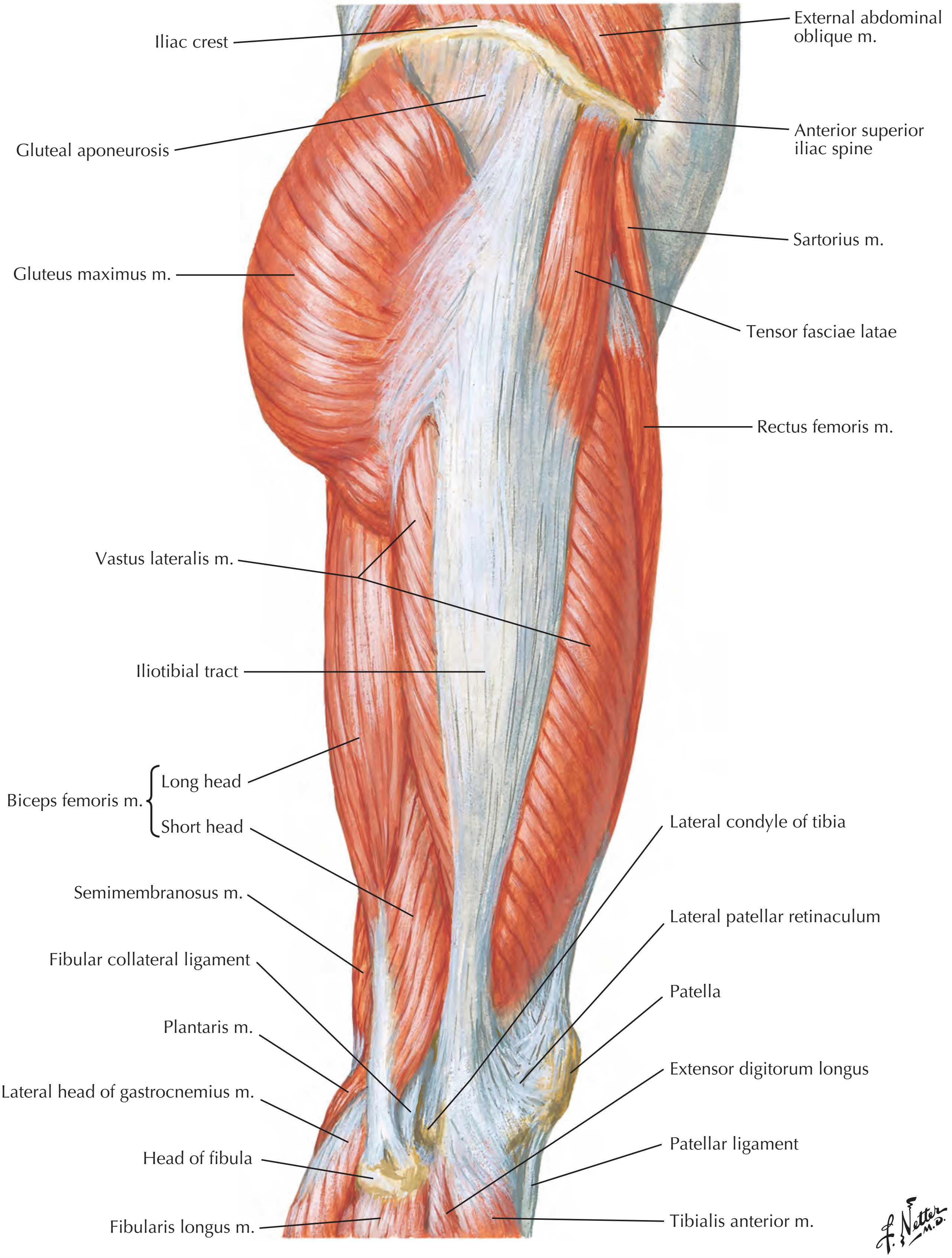
Femur

See also **Plates 514, BP 9**

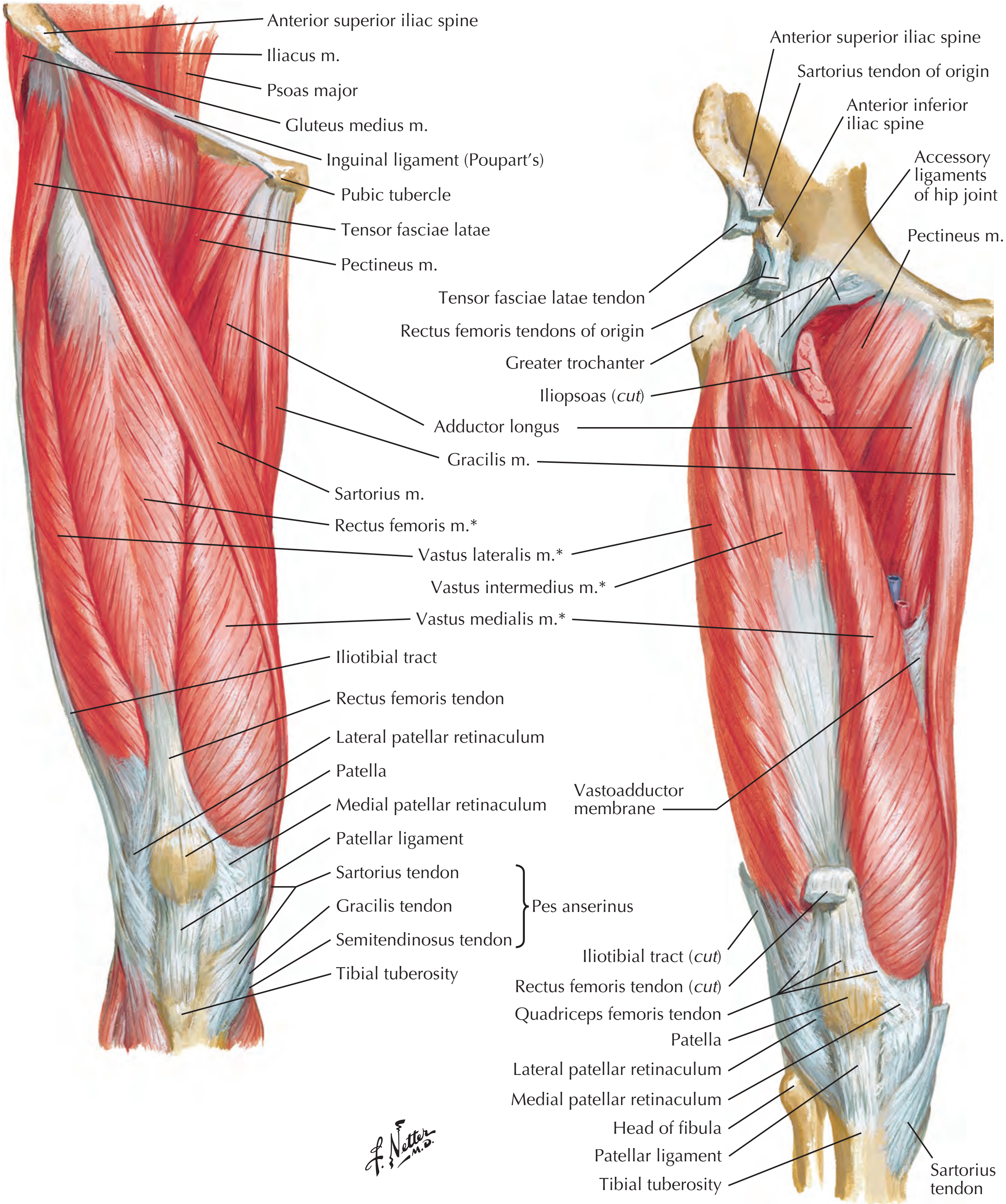

Anterior view
Posterior view
Greater trochanter
Neck
Head
Fovea for ligament of head of femur
Retinacular foramina
Lesser trochanter
Intertrochanteric line
Body
Lateral epicondyle
Adductor tubercle
Medial epicondyle
Lateral condyle
Patellar surface
Medial condyle
Trochanteric fossa
Head
Greater trochanter
Fovea for ligament of head of femur
Neck
Intertrochanteric crest
Lesser trochanter
Quadrate tubercle
Pectineal line
Gluteal tuberosity
Linea aspera
Medial lip
Lateral lip
Nutrient foramen of femur
Body
Line of attachment of synovial membrane
Line of reflection of synovial membrane
Line of attachment of fibrous capsule
Line of reflection of fibrous capsule
Popliteal surface
Medial supracondylar line
Lateral supracondylar line
Adductor tubercle
Medial epicondyle
Lateral epicondyle
Lateral condyle
Medial condyle
Intercondylar fossa

Muscles of Hip and Thigh: Lateral View

See also **Plate 515**

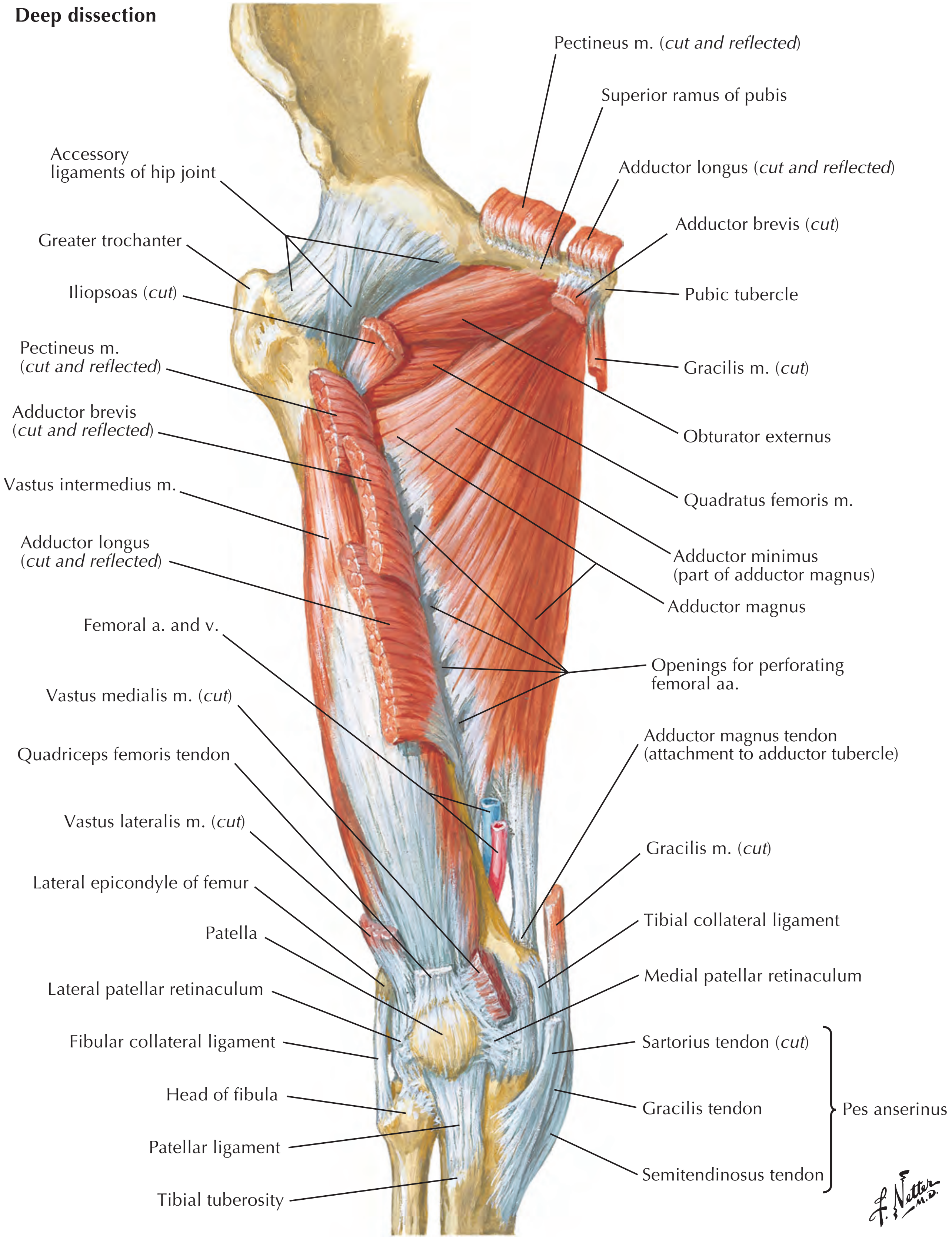

Iliac crest
External abdominal oblique m.
Gluteal aponeurosis
Anterior superior iliac spine
Sartorius m.
Gluteus maximus m.
Tensor fasciae latae
Rectus femoris m.
Vastus lateralis m.
Iliotibial tract
Biceps femoris m.
Long head
Short head
Lateral condyle of tibia
Semimembranosus m.
Lateral patellar retinaculum
Fibular collateral ligament
Patella
Plantaris m.
Extensor digitorum longus
Lateral head of gastrocnemius m.
Patellar ligament
Head of fibula
Fibularis longus m.
Tibialis anterior m.
F. Netter M.D.

See also **Plate 283**

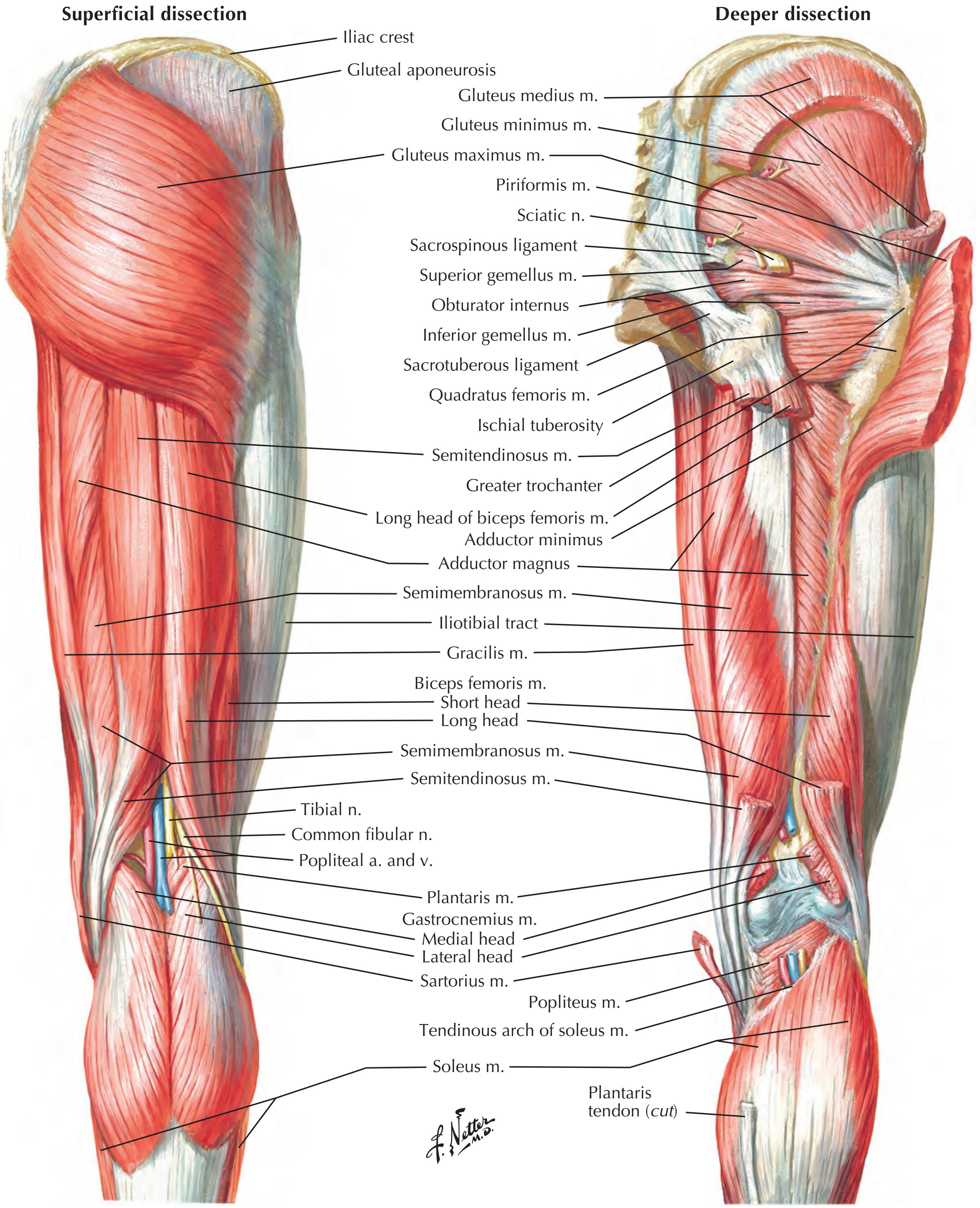

Anterior superior iliac spine
Iliacus m.
Psoas major
Gluteus medius m.
Inguinal ligament (Poupart's)
Pubic tubercle
Tensor fasciae latae
Pectineus m.
Adductor longus
Gracilis m.
Sartorius m.
Rectus femoris m.*
Vastus lateralis m.*
Vastus intermedius m.*
Vastus medialis m.*
Iliotibial tract
Rectus femoris tendon
Lateral patellar retinaculum
Patella
Medial patellar retinaculum
Patellar ligament
Sartorius tendon
Gracilis tendon
Semitendinosus tendon
Pes anserinus
Tibial tuberosity
Anterior superior iliac spine
Sartorius tendon of origin
Anterior inferior iliac spine
Accessory ligaments of hip joint
Pectineus m.
Tensor fasciae latae tendon
Rectus femoris tendons of origin
Greater trochanter
Iliopsoas (*cut*)
Vastoadductor membrane
Iliotibial tract (*cut*)
Rectus femoris tendon (*cut*)
Quadriceps femoris tendon
Patella
Lateral patellar retinaculum
Medial patellar retinaculum
Head of fibula
Patellar ligament
Tibial tuberosity
Sartorius tendon

*Quadriceps femoris muscle

Deep dissection

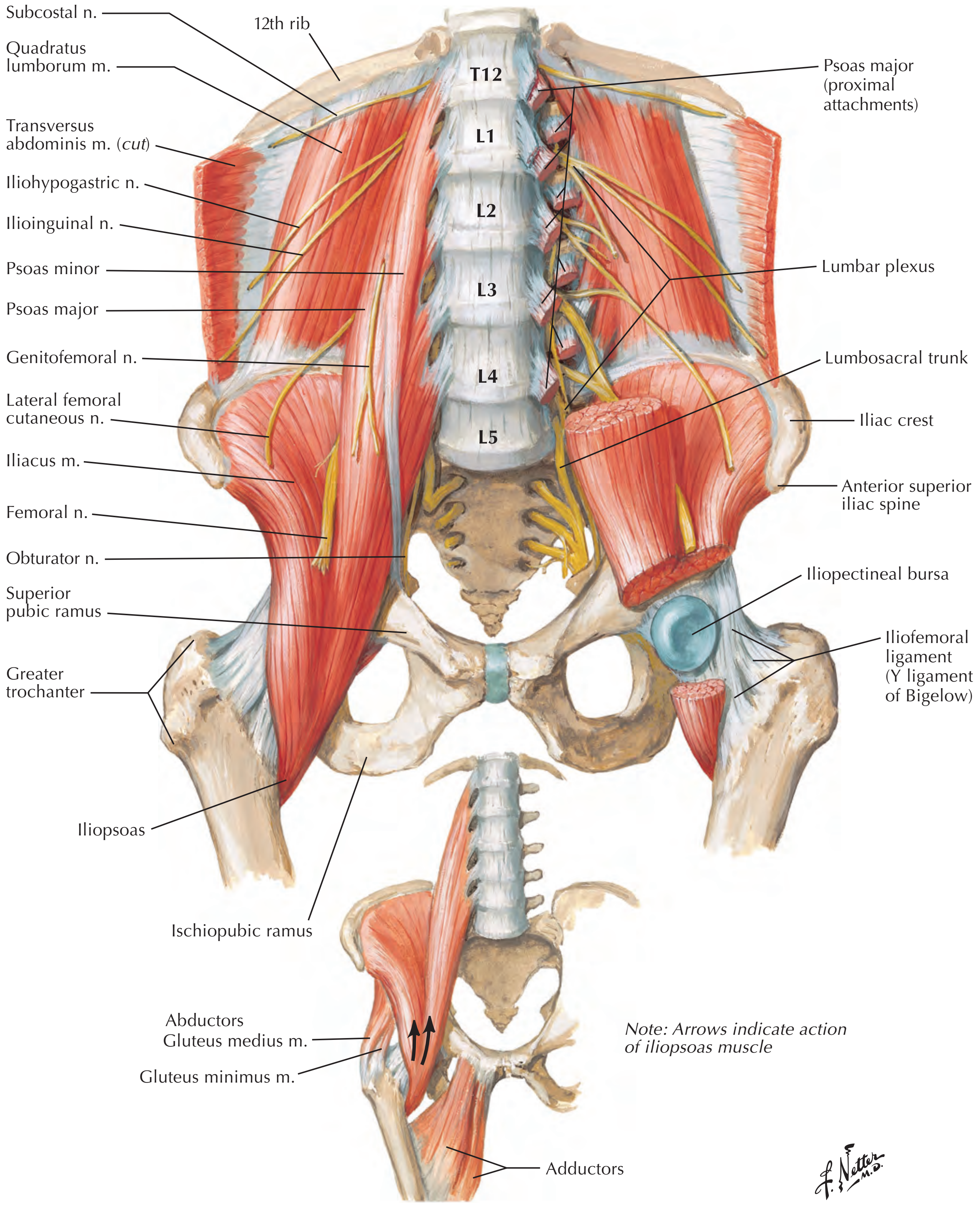

Pectineus m. (*cut and reflected*)
Superior ramus of pubis
Accessory ligaments of hip joint
Adductor longus (*cut and reflected*)
Adductor brevis (*cut*)
Greater trochanter
Pubic tubercle
Iliopsoas (*cut*)
Gracilis m. (*cut*)
Pectineus m. (*cut and reflected*)
Obturator externus
Adductor brevis (*cut and reflected*)
Quadratus femoris m.
Vastus intermedius m.
Adductor minimus (part of adductor magnus)
Adductor longus (*cut and reflected*)
Adductor magnus
Femoral a. and v.
Openings for perforating femoral aa.
Vastus medialis m. (*cut*)
Adductor magnus tendon (attachment to adductor tubercle)
Quadriceps femoris tendon
Vastus lateralis m. (*cut*)
Gracilis m. (*cut*)
Lateral epicondyle of femur
Tibial collateral ligament
Patella
Medial patellar retinaculum
Lateral patellar retinaculum
Fibular collateral ligament
Sartorius tendon (*cut*)
Head of fibula
Gracilis tendon
Pes anserinus
Patellar ligament
Semitendinosus tendon
Tibial tuberosity
F. Netter M.D.

See also **Plates 361, 362, 510**


Superficial dissection
Deeper dissection
Iliac crest
Gluteal aponeurosis
Gluteus medius m.
Gluteus minimus m.
Gluteus maximus m.
Piriformis m.
Sciatic n.
Sacrospinous ligament
Superior gemellus m.
Obturator internus
Inferior gemellus m.
Sacrotuberous ligament
Quadratus femoris m.
Ischial tuberosity
Semitendinosus m.
Greater trochanter
Long head of biceps femoris m.
Adductor minimus
Adductor magnus
Semimembranosus m.
Iliotibial tract
Gracilis m.
Biceps femoris m.
Short head
Long head
Semimembranosus m.
Semitendinosus m.
Tibial n.
Common fibular n.
Popliteal a. and v.
Plantaris m.
Gastrocnemius m.
Medial head
Lateral head
Sartorius m.
Popliteus m.
Tendinous arch of soleus m.
Soleus m.
Plantaris tendon (*cut*)
F. Netter M.D.

Psoas and Iliacus Muscle

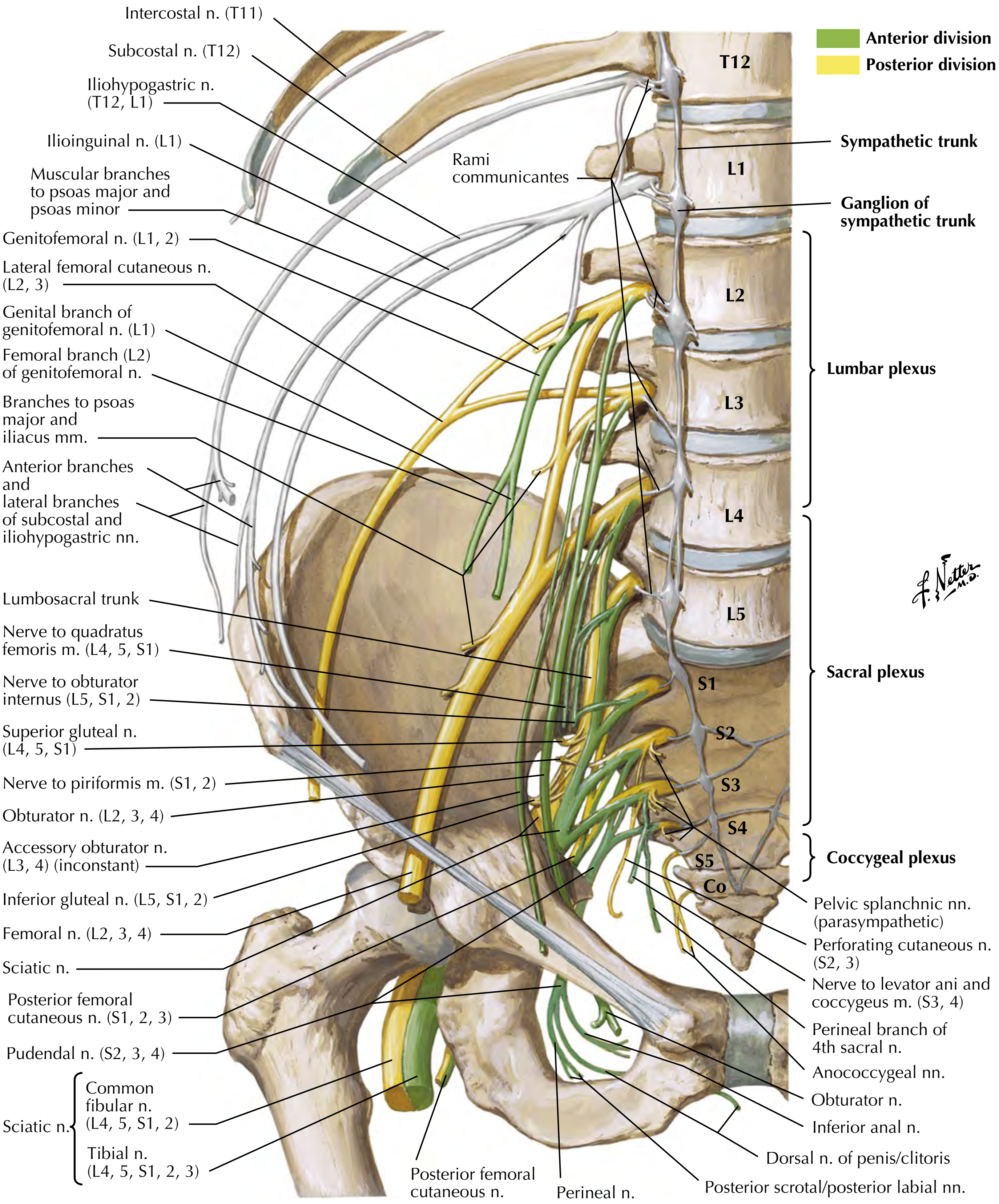
See also **Plates 283, 287**

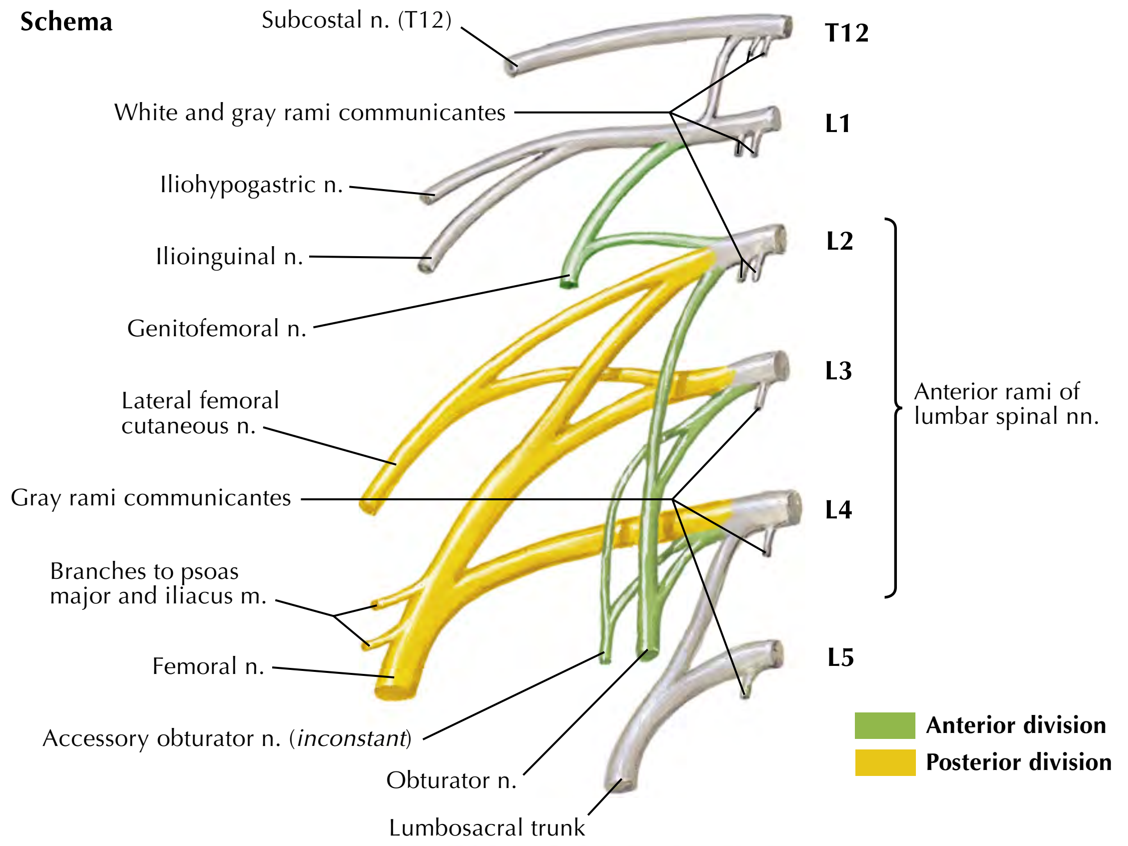

Subcostal n.
12th rib
Quadratus lumborum m.
Transversus abdominis m. (*cut*)
Iliohypogastric n.
Ilioinguinal n.
Psoas minor
Psoas major
Genitofemoral n.
Lateral femoral cutaneous n.
Iliacus m.
Femoral n.
Obturator n.
Superior pubic ramus
Greater trochanter
Iliopsoas
Ischiopubic ramus
T12
L1
L2
L3
L4
L5
Psoas major (proximal attachments)
Lumbar plexus
Lumbosacral trunk
Iliac crest
Anterior superior iliac spine
Iliopectineal bursa
Iliofemoral ligament (Y ligament of Bigelow)
Abductors
Gluteus medius m.
Gluteus minimus m.
Adductors

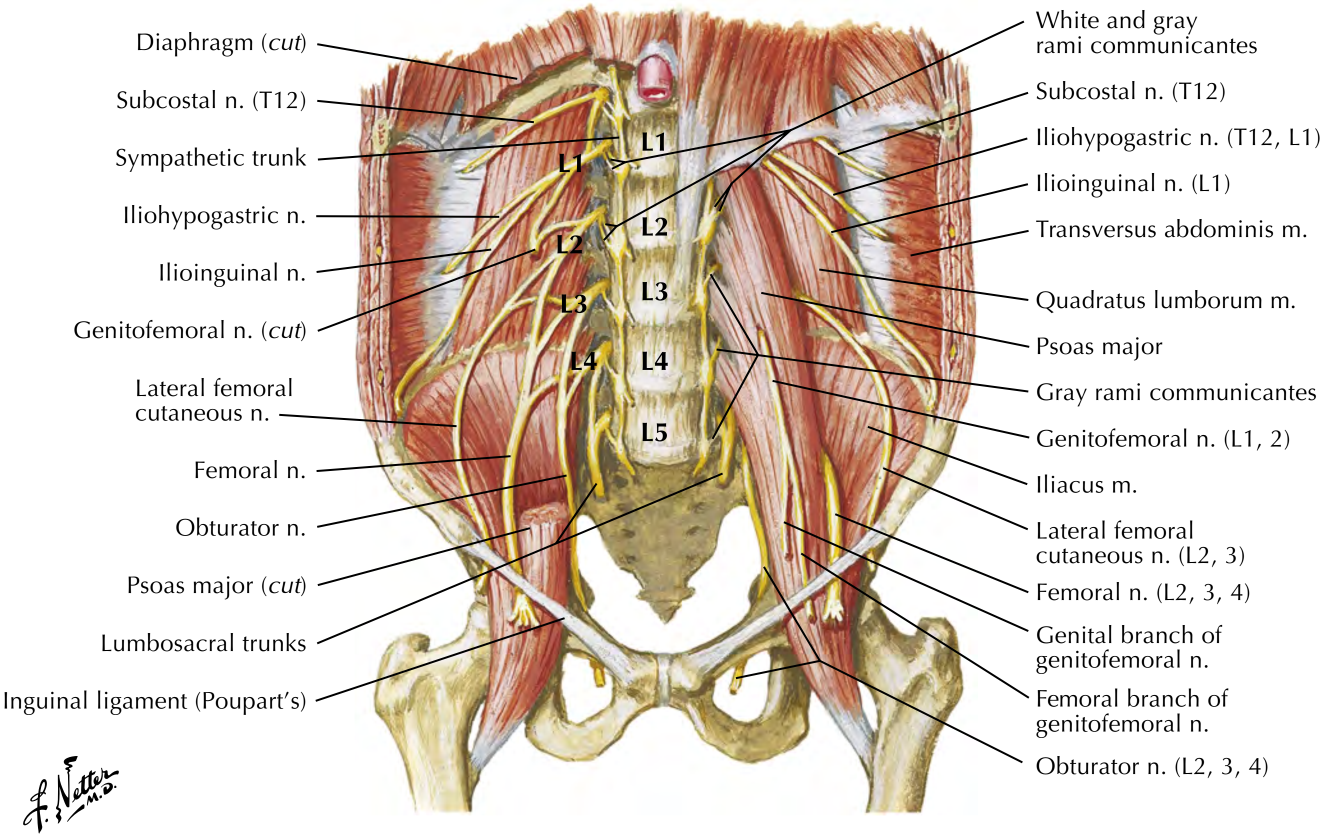
Note: Arrows indicate action of iliopsoas muscle

Lumbosacral Plexuses

See also **Plate 287**

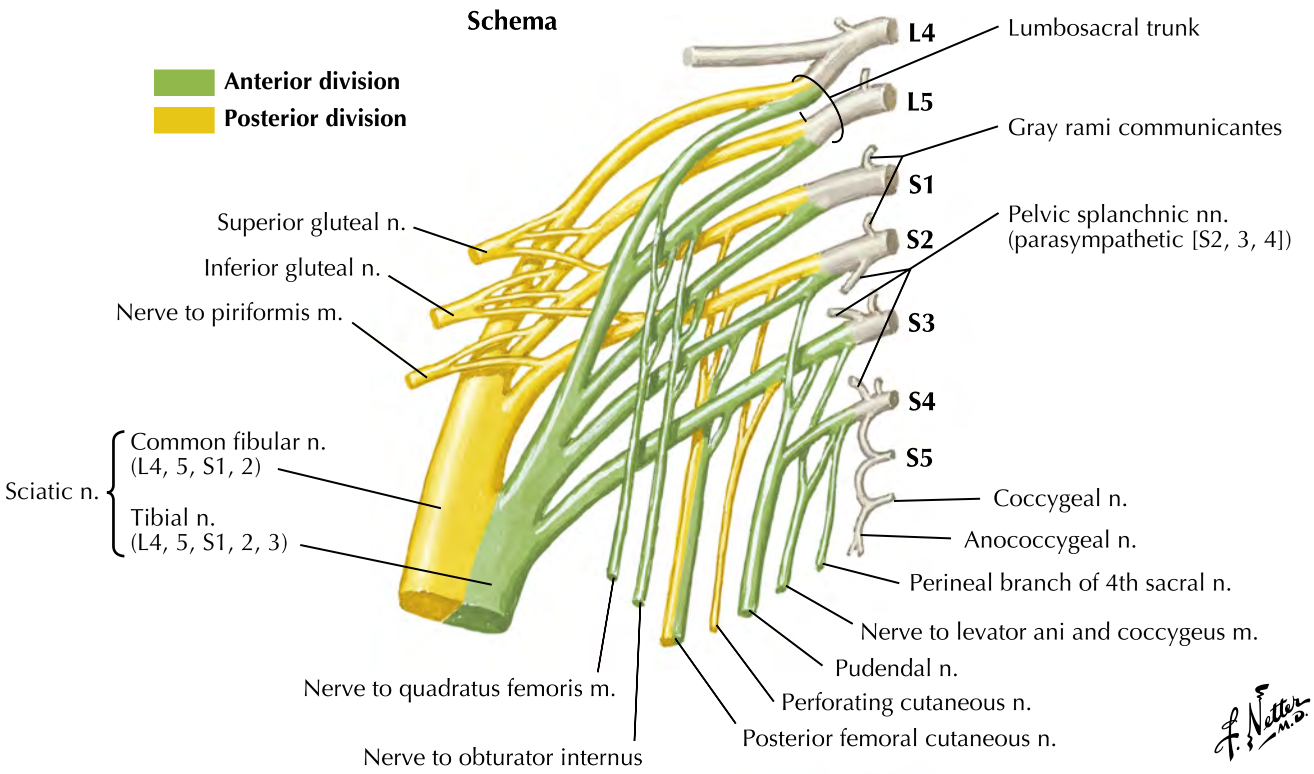

🟩 Anterior division
🟨 Posterior division
Intercostal n. (T11)
Subcostal n. (T12)
Iliohypogastric n. (T12, L1)
Ilioinguinal n. (L1)
Muscular branches to psoas major and psoas minor
Genitofemoral n. (L1, 2)
Lateral femoral cutaneous n. (L2, 3)
Genital branch of genitofemoral n. (L1)
Femoral branch (L2) of genitofemoral n.
Branches to psoas major and iliacus mm.
Anterior branches and lateral branches of subcostal and iliohypogastric nn.
Lumbosacral trunk
Nerve to quadratus femoris m. (L4, 5, S1)
Nerve to obturator internus (L5, S1, 2)
Superior gluteal n. (L4, 5, S1)
Nerve to piriformis m. (S1, 2)
Obturator n. (L2, 3, 4)
Accessory obturator n. (L3, 4) (inconstant)
Inferior gluteal n. (L5, S1, 2)
Femoral n. (L2, 3, 4)
Sciatic n.
Posterior femoral cutaneous n. (S1, 2, 3)
Pudendal n. (S2, 3, 4)
Sciatic n.
Common fibular n. (L4, 5, S1, 2)
Tibial n. (L4, 5, S1, 2, 3)
Rami communicantes
T12
L1
L2
L3
L4
L5
S1
S2
S3
S4
S5
Co
Sympathetic trunk
Ganglion of sympathetic trunk
Lumbar plexus
Sacral plexus
Coccygeal plexus
Pelvic splanchnic nn. (parasympathetic)
Perforating cutaneous n. (S2, 3)
Nerve to levator ani and coccygeus m. (S3, 4)
Perineal branch of 4th sacral n.
Anococcygeal nn.
Obturator n.
Inferior anal n.
Dorsal n. of penis/clitoris
Posterior scrotal/posterior labial nn.
Posterior femoral cutaneous n.
Perineal n.
F. Netter M.D.


Schema
Subcostal n. (T12)
White and gray rami communicantes
Iliohypogastric n.
Ilioinguinal n.
Genitofemoral n.
Lateral femoral cutaneous n.
Gray rami communicantes
Branches to psoas major and iliacus m.
Femoral n.
Accessory obturator n. (*inconstant*)
Obturator n.
Lumbosacral trunk
T12
L1
L2
L3
L4
L5
Anterior rami of lumbar spinal nn.
🟩 Anterior division
🟨 Posterior division


Diaphragm (*cut*)
Subcostal n. (T12)
Sympathetic trunk
Iliohypogastric n.
Ilioinguinal n.
Genitofemoral n. (*cut*)
Lateral femoral cutaneous n.
Femoral n.
Obturator n.
Psoas major (*cut*)
Lumbosacral trunks
Inguinal ligament (Poupart's)
L1
L2
L3
L4
L5
L1
L2
L3
L4
White and gray rami communicantes
Subcostal n. (T12)
Iliohypogastric n. (T12, L1)
Ilioinguinal n. (L1)
Transversus abdominis m.
Quadratus lumborum m.
Psoas major
Gray rami communicantes
Genitofemoral n. (L1, 2)
Iliacus m.
Lateral femoral cutaneous n. (L2, 3)
Femoral n. (L2, 3, 4)
Genital branch of genitofemoral n.
Femoral branch of genitofemoral n.
Obturator n. (L2, 3, 4)
F. Netter M.D.

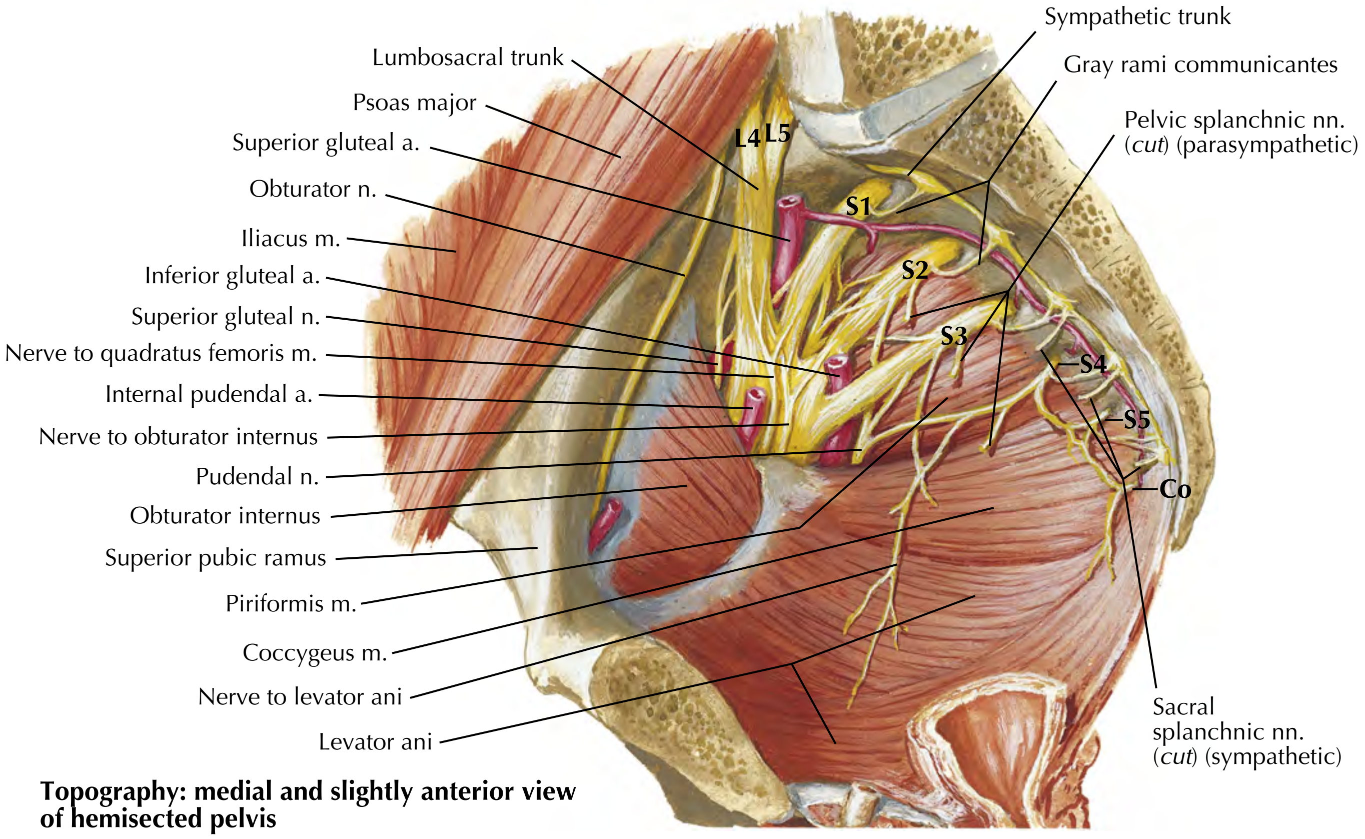
Sacral and Coccygeal Plexuses

See also **Plate 287**



Schema

🟩 Anterior division
🟨 Posterior division
L4
L5
S1
S2
S3
S4
S5
Lumbosacral trunk
Gray rami communicantes
Pelvic splanchnic nn. (parasympathetic [S2, 3, 4])
Superior gluteal n.
Inferior gluteal n.
Nerve to piriformis m.
Sciatic n.
Common fibular n. (L4, 5, S1, 2)
Tibial n. (L4, 5, S1, 2, 3)
Coccygeal n.
Anococcygeal n.
Perineal branch of 4th sacral n.
Nerve to levator ani and coccygeus m.
Pudendal n.
Perforating cutaneous n.
Posterior femoral cutaneous n.
Nerve to quadratus femoris m.
Nerve to obturator internus

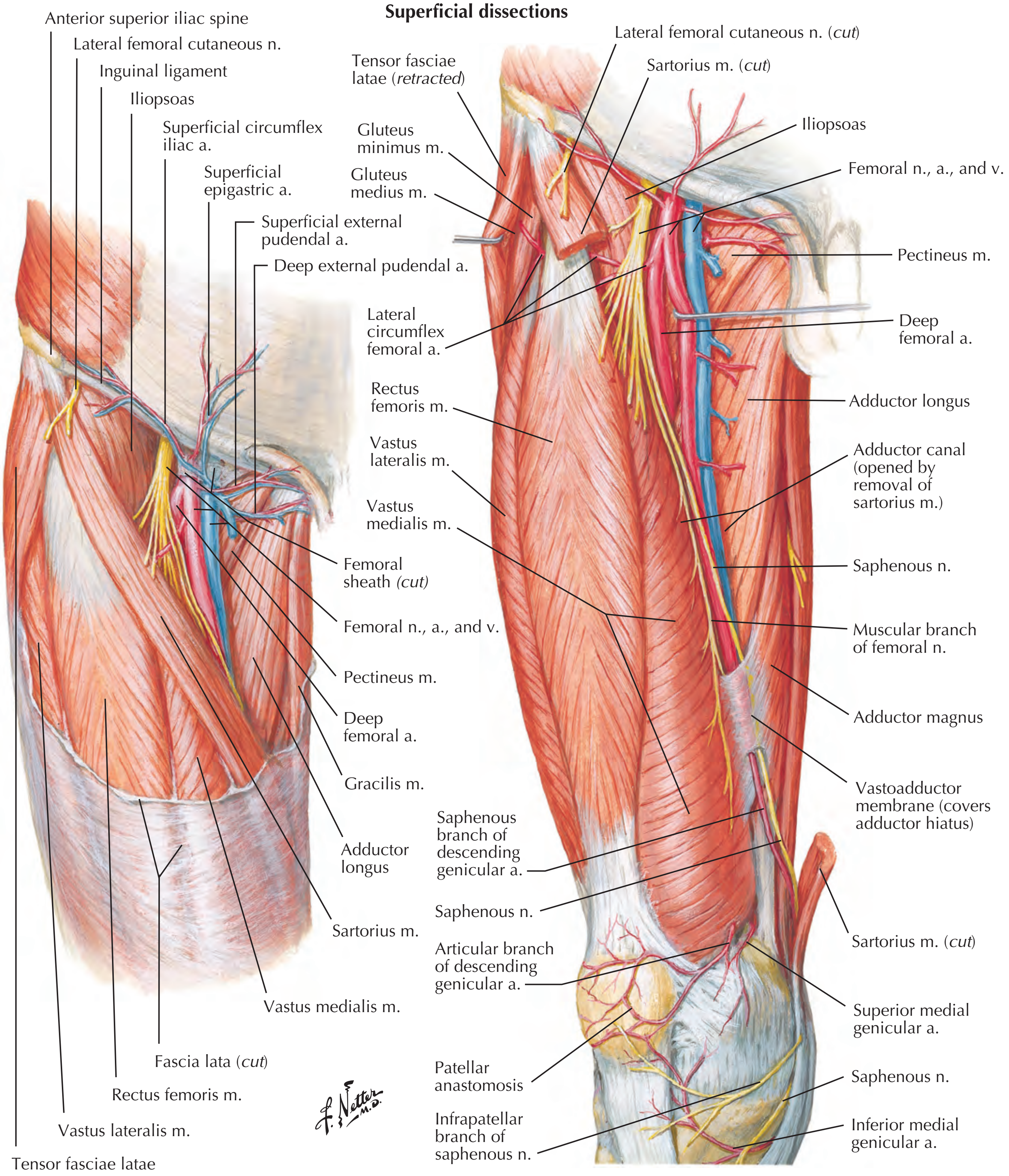


Lumbosacral trunk
Psoas major
Superior gluteal a.
Obturator n.
Iliacus m.
Inferior gluteal a.
Superior gluteal n.
Nerve to quadratus femoris m.
Internal pudendal a.
Nerve to obturator internus
Pudendal n.
Obturator internus
Superior pubic ramus
Piriformis m.
Coccygeus m.
Nerve to levator ani
Levator ani
L4
L5
S1
S2
S3
S4
S5
Co
Sympathetic trunk
Gray rami communicantes
Pelvic splanchnic nn. (*cut*) (parasympathetic)
Sacral splanchnic nn. (*cut*) (sympathetic)

Topography: medial and slightly anterior view of hemisected pelvis

Arteries of Thigh: Anterior Views

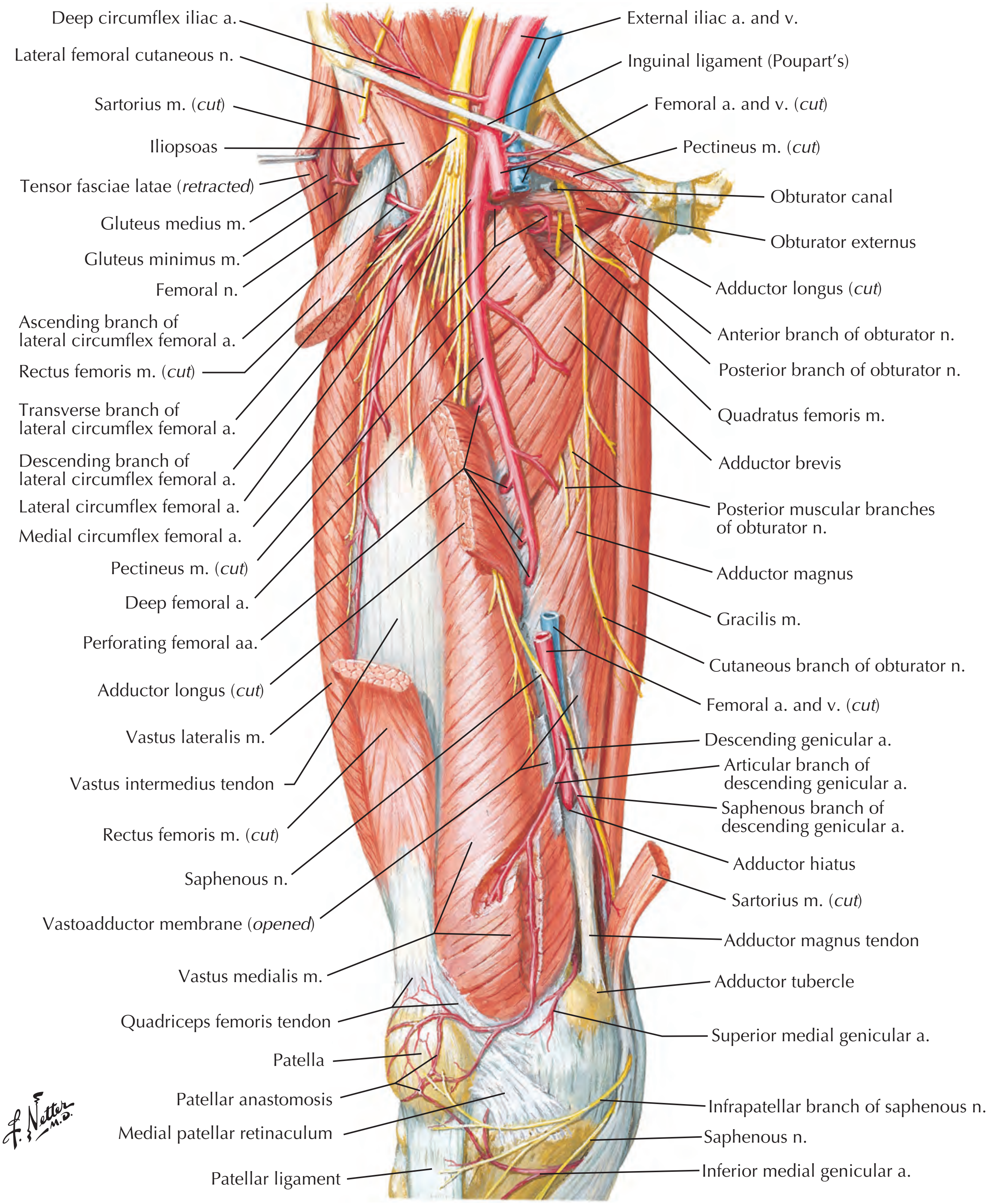
See also **Plates 522, 550, BP 103**


Superficial dissections
Anterior superior iliac spine
Lateral femoral cutaneous n.
Inguinal ligament
Iliopsoas
Superficial circumflex iliac a.
Superficial epigastric a.
Superficial external pudendal a.
Deep external pudendal a.
Femoral sheath (*cut*)
Femoral n., a., and v.
Pectineus m.
Deep femoral a.
Gracilis m.
Adductor longus
Sartorius m.
Vastus medialis m.
Fascia lata (*cut*)
Rectus femoris m.
Vastus lateralis m.
Tensor fasciae latae
F. Netter M.D.
Tensor fasciae latae (*retracted*)
Gluteus minimus m.
Gluteus medius m.
Lateral circumflex femoral a.
Rectus femoris m.
Vastus lateralis m.
Vastus medialis m.
Saphenous branch of descending genicular a.
Saphenous n.
Articular branch of descending genicular a.
Patellar anastomosis
Infrapatellar branch of saphenous n.
Lateral femoral cutaneous n. (*cut*)
Sartorius m. (*cut*)
Iliopsoas
Femoral n., a., and v.
Pectineus m.
Deep femoral a.
Adductor longus
Adductor canal (opened by removal of sartorius m.)
Saphenous n.
Muscular branch of femoral n.
Adductor magnus
Vastoadductor membrane (covers adductor hiatus)
Sartorius m. (*cut*)
Superior medial genicular a.
Saphenous n.
Inferior medial genicular a.

Arteries of Thigh: Anterior View of Deeper Dissection

See also **Plates 550, 551, BP 103**

Deep dissection

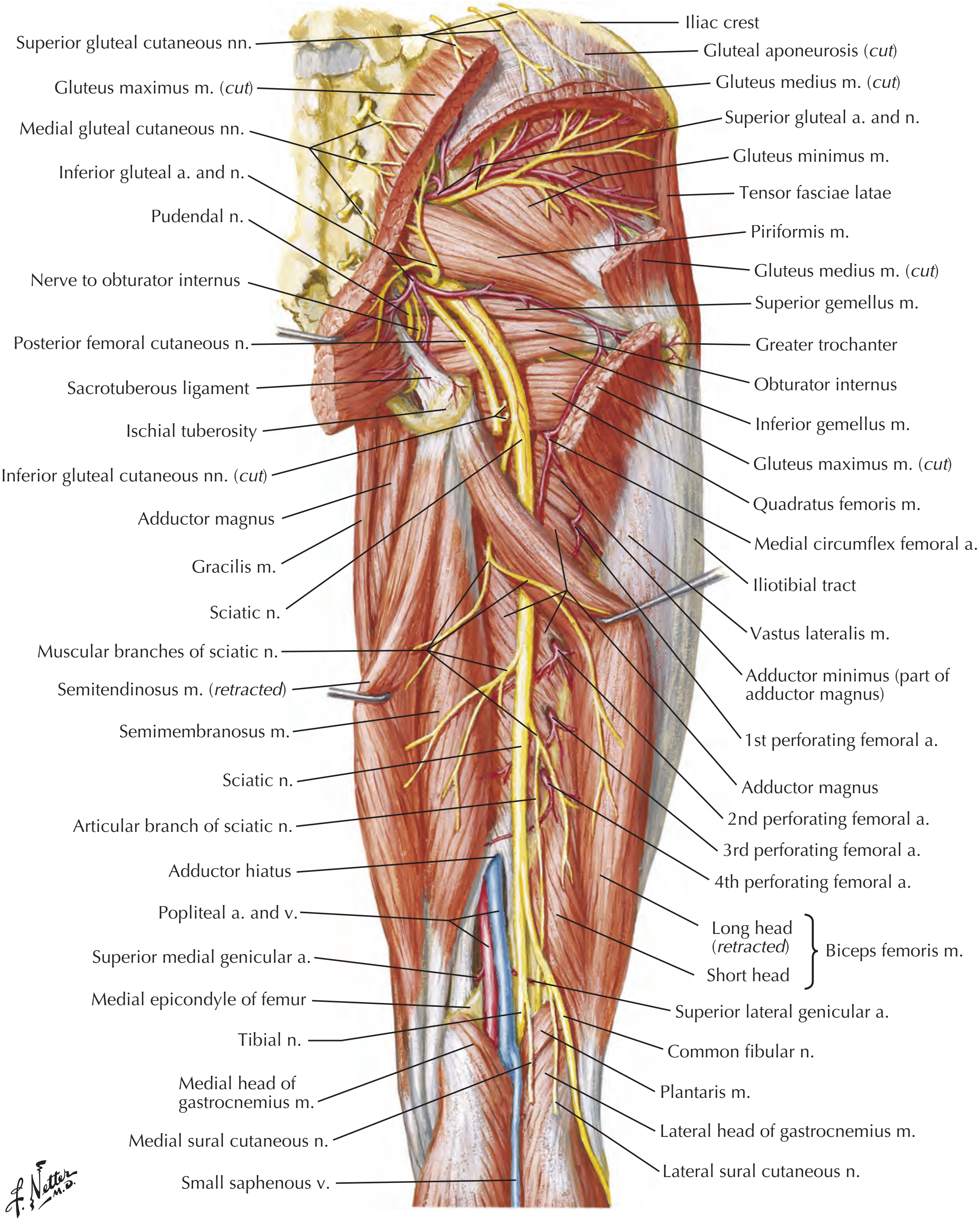


Deep circumflex iliac a.
Lateral femoral cutaneous n.
Sartorius m. (*cut*)
Iliopsoas
Tensor fasciae latae (*retracted*)
Gluteus medius m.
Gluteus minimus m.
Femoral n.
Ascending branch of lateral circumflex femoral a.
Rectus femoris m. (*cut*)
Transverse branch of lateral circumflex femoral a.
Descending branch of lateral circumflex femoral a.
Lateral circumflex femoral a.
Medial circumflex femoral a.
Pectineus m. (*cut*)
Deep femoral a.
Perforating femoral aa.
Adductor longus (*cut*)
Vastus lateralis m.
Vastus intermedius tendon
Rectus femoris m. (*cut*)
Saphenous n.
Vastoadductor membrane (*opened*)
Vastus medialis m.
Quadriceps femoris tendon
Patella
Patellar anastomosis
Medial patellar retinaculum
Patellar ligament
External iliac a. and v.
Inguinal ligament (Poupart's)
Femoral a. and v. (*cut*)
Pectineus m. (*cut*)
Obturator canal
Obturator externus
Adductor longus (*cut*)
Anterior branch of obturator n.
Posterior branch of obturator n.
Quadratus femoris m.
Adductor brevis
Posterior muscular branches of obturator n.
Adductor magnus
Gracilis m.
Cutaneous branch of obturator n.
Femoral a. and v. (*cut*)
Descending genicular a.
Articular branch of descending genicular a.
Saphenous branch of descending genicular a.
Adductor hiatus
Sartorius m. (*cut*)
Adductor magnus tendon
Adductor tubercle
Superior medial genicular a.
Infrapatellar branch of saphenous n.
Saphenous n.
Inferior medial genicular a.

Arteries of Thigh: Posterior View

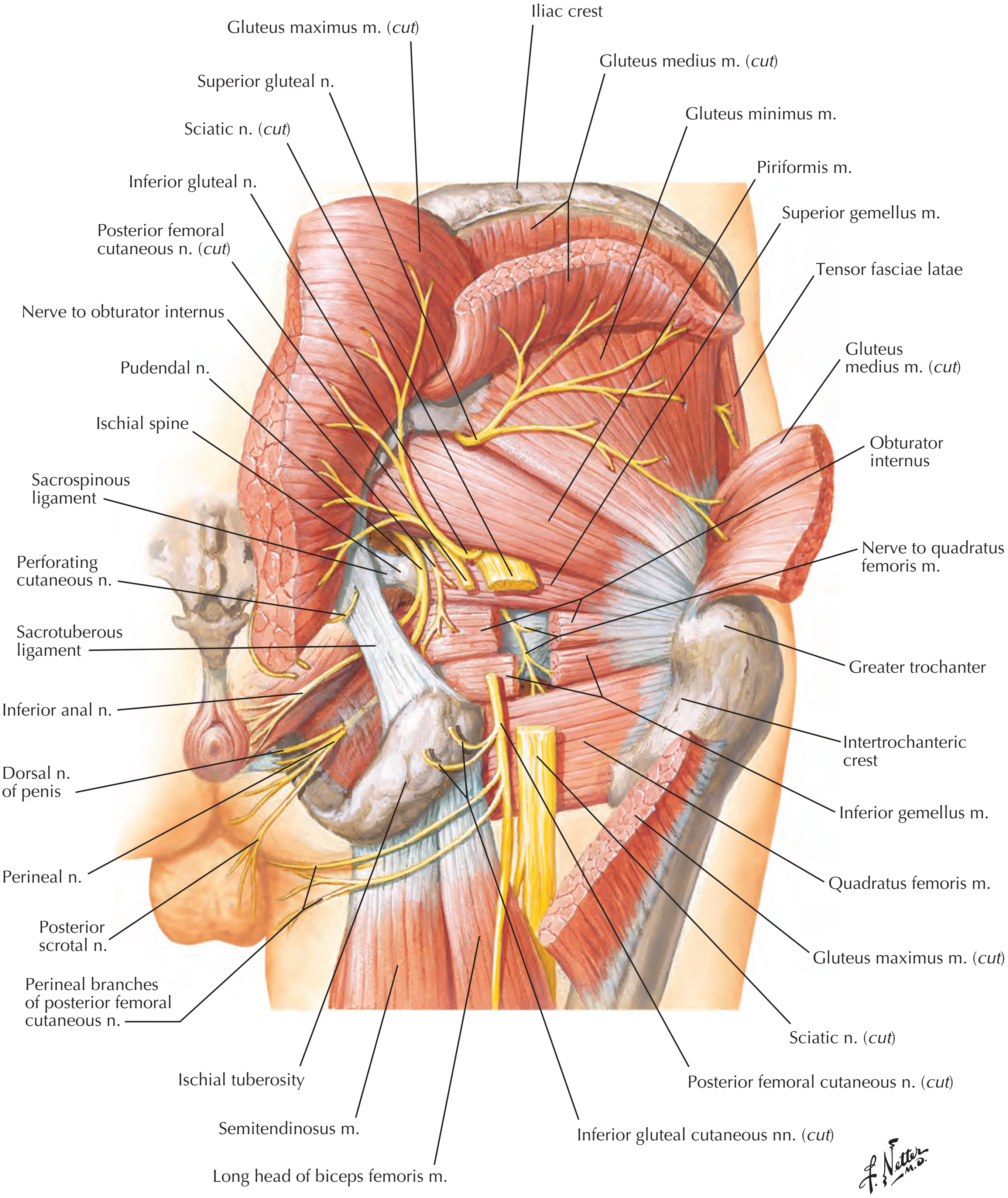
See also **Plates 552, BP 103**

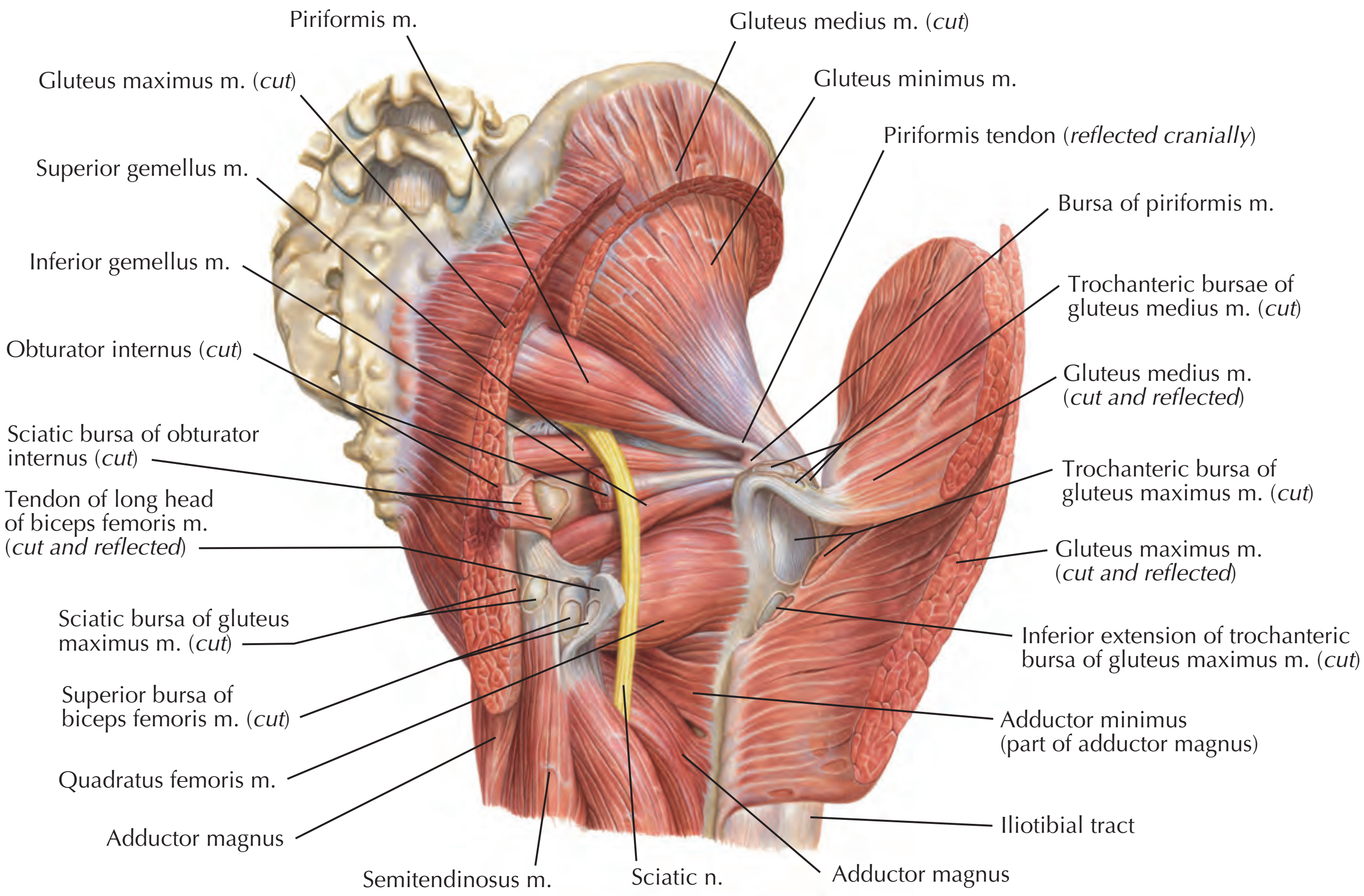
Deep dissection

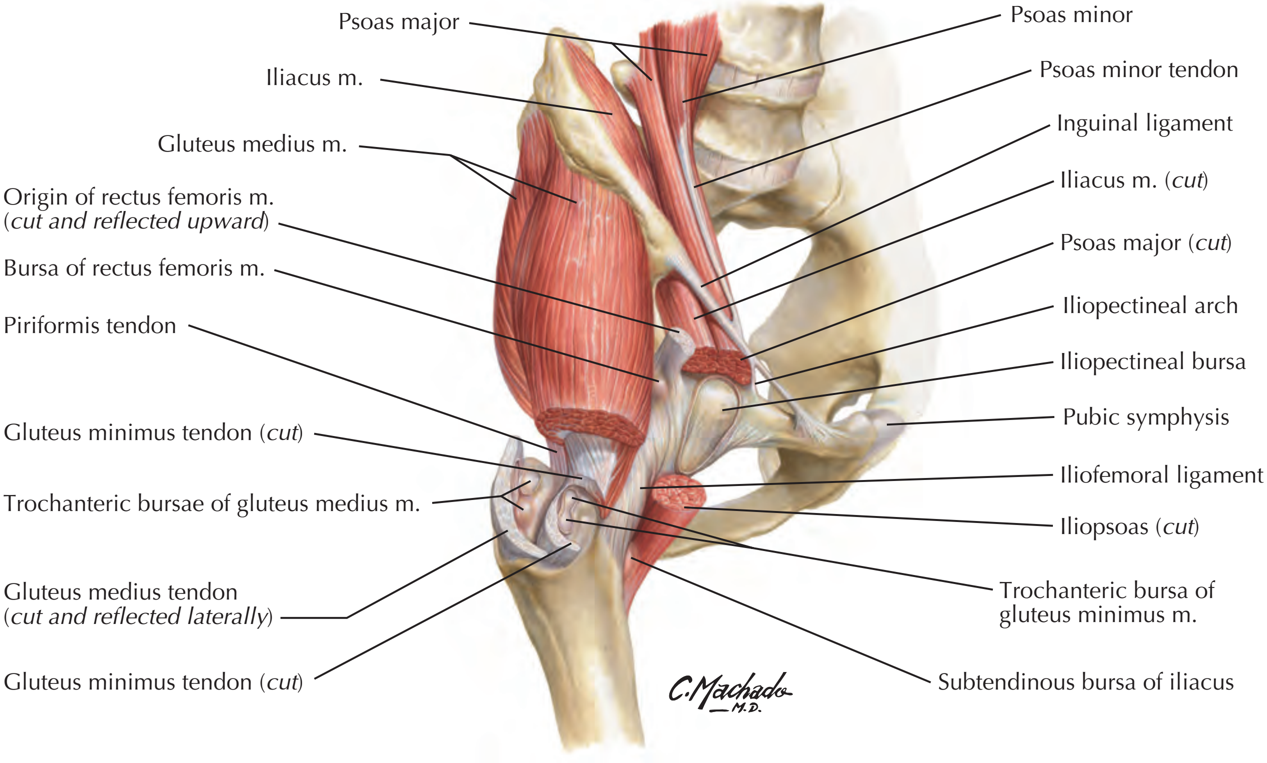

Superior gluteal cutaneous nn.
Gluteus maximus m. (*cut*)
Medial gluteal cutaneous nn.
Inferior gluteal a. and n.
Pudendal n.
Nerve to obturator internus
Posterior femoral cutaneous n.
Sacrotuberous ligament
Ischial tuberosity
Inferior gluteal cutaneous nn. (*cut*)
Adductor magnus
Gracilis m.
Sciatic n.
Muscular branches of sciatic n.
Semitendinosus m. (*retracted*)
Semimembranosus m.
Sciatic n.
Articular branch of sciatic n.
Adductor hiatus
Popliteal a. and v.
Superior medial genicular a.
Medial epicondyle of femur
Tibial n.
Medial head of gastrocnemius m.
Medial sural cutaneous n.
Small saphenous v.
Iliac crest
Gluteal aponeurosis (*cut*)
Gluteus medius m. (*cut*)
Superior gluteal a. and n.
Gluteus minimus m.
Tensor fasciae latae
Piriformis m.
Gluteus medius m. (*cut*)
Superior gemellus m.
Greater trochanter
Obturator internus
Inferior gemellus m.
Gluteus maximus m. (*cut*)
Quadratus femoris m.
Medial circumflex femoral a.
Iliotibial tract
Vastus lateralis m.
Adductor minimus (part of adductor magnus)
1st perforating femoral a.
Adductor magnus
2nd perforating femoral a.
3rd perforating femoral a.
4th perforating femoral a.
Long head (*retracted*)
Short head
Biceps femoris m.
Superior lateral genicular a.
Common fibular n.
Plantaris m.
Lateral head of gastrocnemius m.
Lateral sural cutaneous n.
F. Netter M.D.

Nerves of Buttock

See also **Plates 356, 413**


Iliac crest
Gluteus maximus m. (*cut*)
Gluteus medius m. (*cut*)
Superior gluteal n.
Gluteus minimus m.
Sciatic n. (*cut*)
Piriformis m.
Inferior gluteal n.
Superior gemellus m.
Posterior femoral cutaneous n. (*cut*)
Tensor fasciae latae
Nerve to obturator internus
Gluteus medius m. (*cut*)
Pudendal n.
Ischial spine
Obturator internus
Sacrospinous ligament
Nerve to quadratus femoris m.
Perforating cutaneous n.
Sacrotuberous ligament
Greater trochanter
Inferior anal n.
Intertrochanteric crest
Dorsal n. of penis
Inferior gemellus m.
Perineal n.
Quadratus femoris m.
Posterior scrotal n.
Gluteus maximus m. (*cut*)
Perineal branches of posterior femoral cutaneous n.
Sciatic n. (*cut*)
Ischial tuberosity
Posterior femoral cutaneous n. (*cut*)
Semitendinosus m.
Inferior gluteal cutaneous nn. (*cut*)
Long head of biceps femoris m.

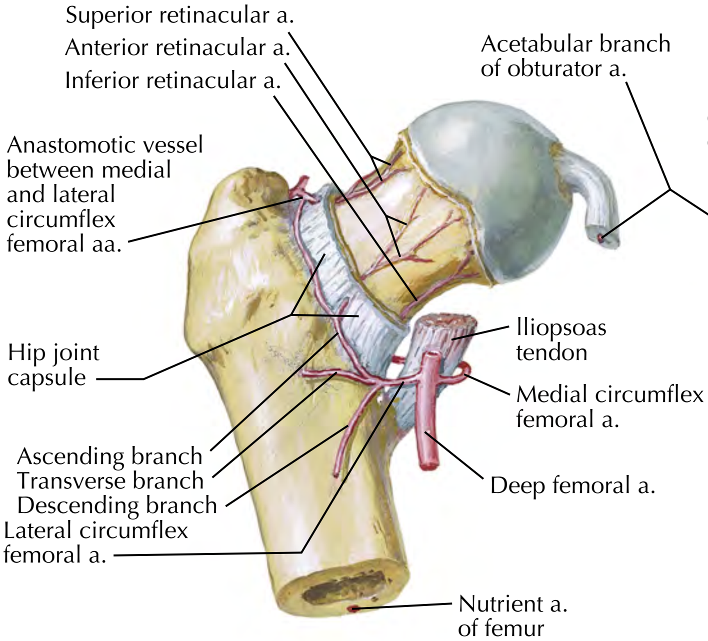

Piriformis m.
Gluteus maximus m. (*cut*)
Superior gemellus m.
Inferior gemellus m.
Obturator internus (*cut*)
Sciatic bursa of obturator internus (*cut*)
Tendon of long head of biceps femoris m. (*cut and reflected*)
Sciatic bursa of gluteus maximus m. (*cut*)
Superior bursa of biceps femoris m. (*cut*)
Quadratus femoris m.
Adductor magnus
Semitendinosus m.
Sciatic n.
Adductor magnus
Gluteus medius m. (*cut*)
Gluteus minimus m.
Piriformis tendon (*reflected cranially*)
Bursa of piriformis m.
Trochanteric bursae of gluteus medius m. (*cut*)
Gluteus medius m. (*cut and reflected*)
Trochanteric bursa of gluteus maximus m. (*cut*)
Gluteus maximus m. (*cut and reflected*)
Inferior extension of trochanteric bursa of gluteus maximus m. (*cut*)
Adductor minimus (part of adductor magnus)
Iliotibial tract


Psoas major
Iliacus m.
Gluteus medius m.
Origin of rectus femoris m. (*cut and reflected upward*)
Bursa of rectus femoris m.
Piriformis tendon
Gluteus minimus tendon (*cut*)
Trochanteric bursae of gluteus medius m.
Gluteus medius tendon (*cut and reflected laterally*)
Gluteus minimus tendon (*cut*)
Psoas minor
Psoas minor tendon
Inguinal ligament
Iliacus m. (*cut*)
Psoas major (*cut*)
Iliopectineal arch
Iliopectineal bursa
Pubic symphysis
Iliofemoral ligament
Iliopsoas (*cut*)
Trochanteric bursa of gluteus minimus m.
Subtendinous bursa of iliacus
C.Machado M.D.

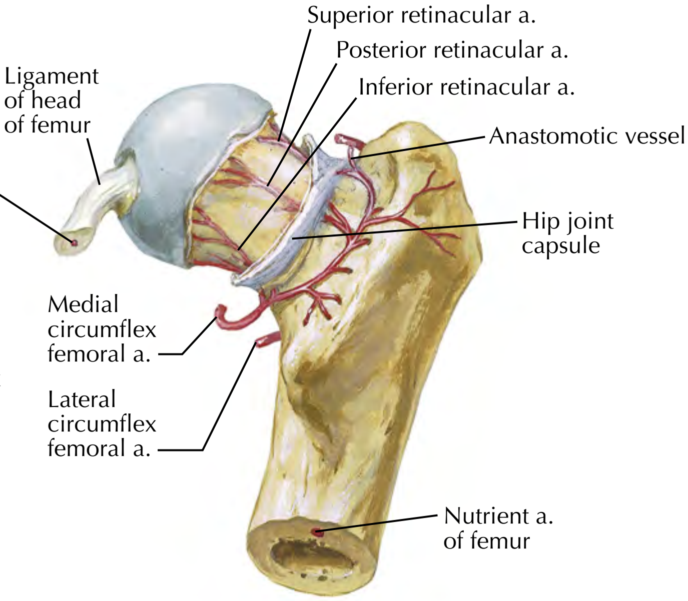
Arteries of Femoral Head and Neck

See also **Plates 496, 522**

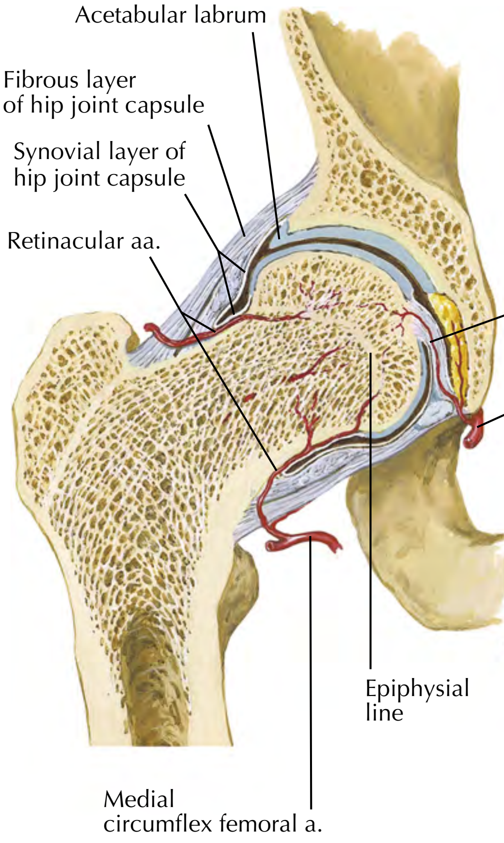
Anterior view


Superior retinacular a.
Anterior retinacular a.
Inferior retinacular a.
Acetabular branch of obturator a.
Anastomotic vessel between medial and lateral circumflex femoral aa.
Hip joint capsule
Iliopsoas tendon
Medial circumflex femoral a.
Ascending branch
Transverse branch
Descending branch
Lateral circumflex femoral a.
Deep femoral a.
Nutrient a. of femur

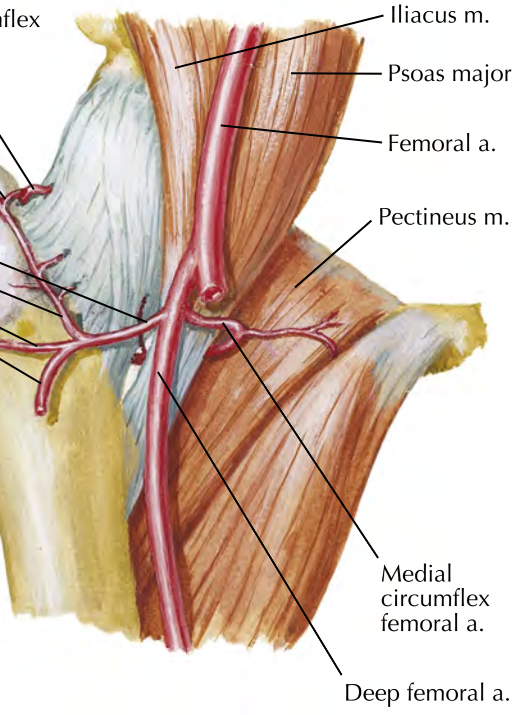
Posterior view

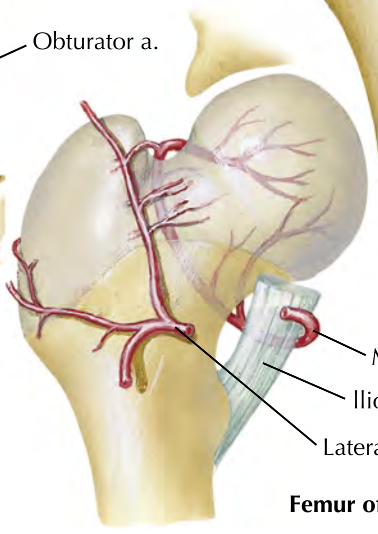

Ligament of head of femur
Superior retinacular a.
Posterior retinacular a.
Inferior retinacular a.
Anastomotic vessel
Hip joint capsule
Medial circumflex femoral a.
Lateral circumflex femoral a.
Nutrient a. of femur

Coronal section

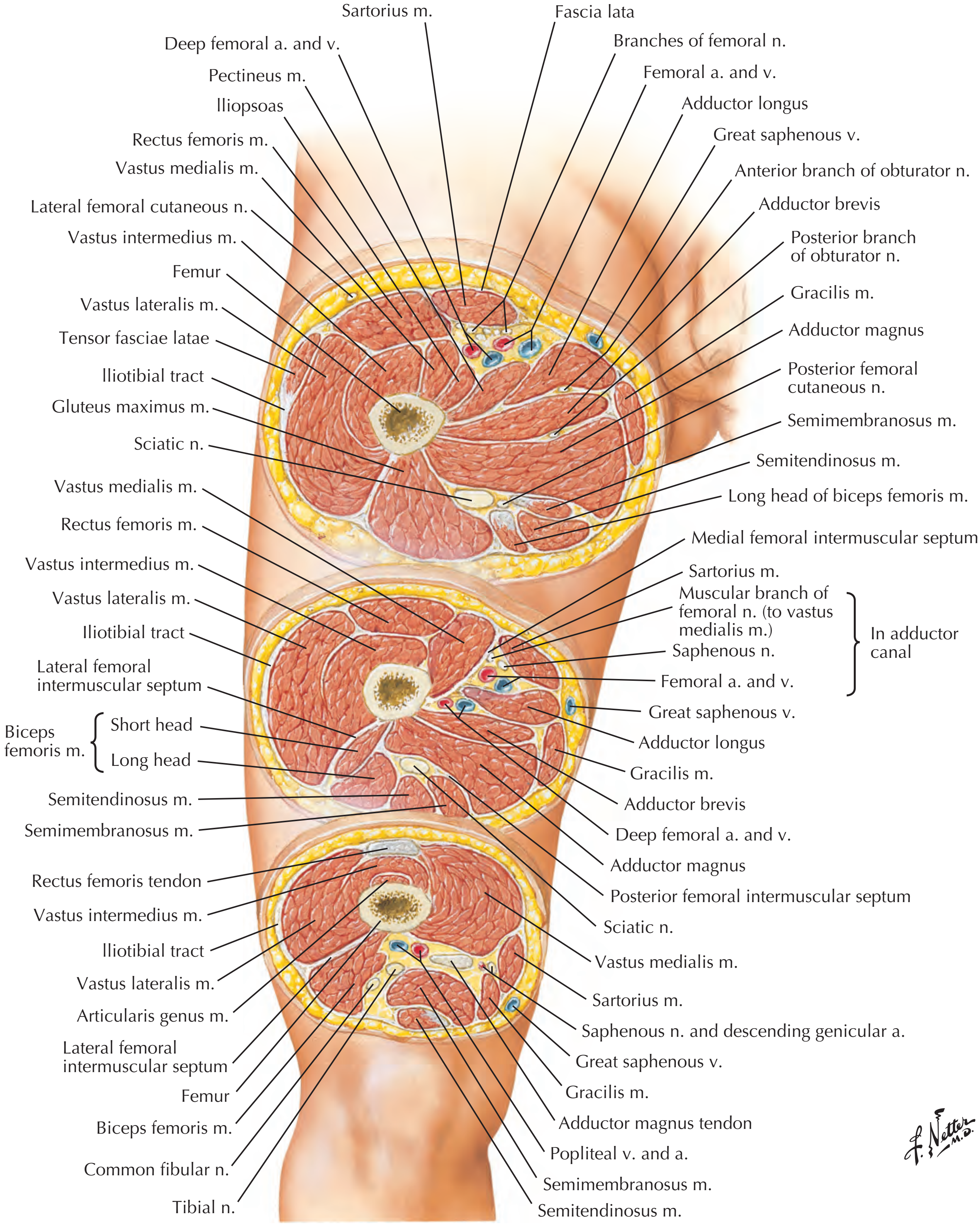

Acetabular labrum
Fibrous layer of hip joint capsule
Synovial layer of hip joint capsule
Retinacular aa.
Acetabular branch of obturator a.
Obturator a.
Epiphysial line
Medial circumflex femoral a.

Anterior view

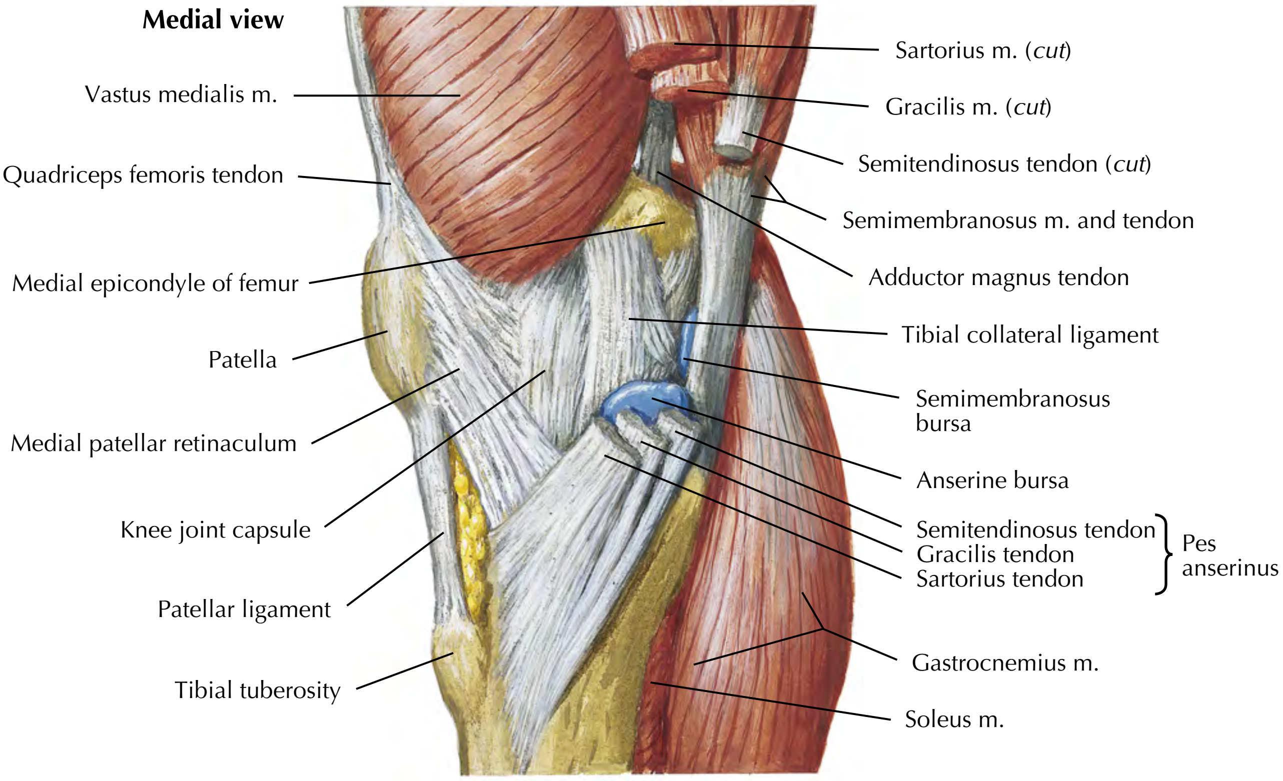

Medial circumflex femoral a.
Anastomotic vessel
Lateral circumflex femoral a.
Ascending branch
Transverse branch
Descending branch
Iliacus m.
Psoas major
Femoral a.
Pectineus m.
Medial circumflex femoral a.
Deep femoral a.


Medial circumflex femoral a.
Iliopsoas tendon
Lateral circumflex femoral a.

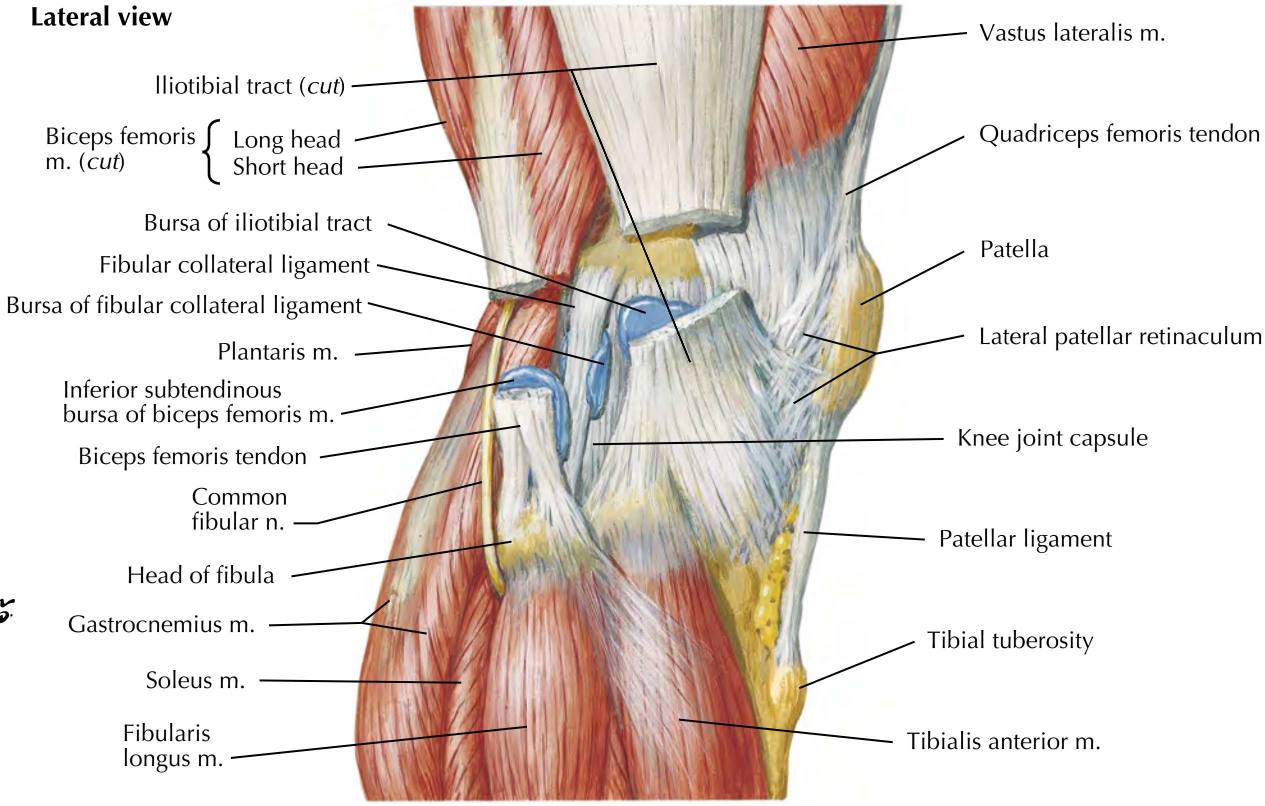
Femur of child: anterior view


Sartorius m.
Fascia lata
Deep femoral a. and v.
Branches of femoral n.
Pectineus m.
Femoral a. and v.
Iliopsoas
Adductor longus
Rectus femoris m.
Great saphenous v.
Vastus medialis m.
Anterior branch of obturator n.
Lateral femoral cutaneous n.
Adductor brevis
Vastus intermedius m.
Posterior branch of obturator n.
Femur
Gracilis m.
Vastus lateralis m.
Adductor magnus
Tensor fasciae latae
Posterior femoral cutaneous n.
Iliotibial tract
Gluteus maximus m.
Semimembranosus m.
Sciatic n.
Semitendinosus m.
Long head of biceps femoris m.
Vastus medialis m.
Medial femoral intermuscular septum
Rectus femoris m.
Sartorius m.
Vastus intermedius m.
Muscular branch of femoral n. (to vastus medialis m.)
Vastus lateralis m.
Saphenous n.
In adductor canal
Iliotibial tract
Femoral a. and v.
Lateral femoral intermuscular septum
Great saphenous v.
Biceps femoris m.
Short head
Long head
Adductor longus
Gracilis m.
Semitendinosus m.
Adductor brevis
Semimembranosus m.
Deep femoral a. and v.
Adductor magnus
Rectus femoris tendon
Posterior femoral intermuscular septum
Vastus intermedius m.
Sciatic n.
Iliotibial tract
Vastus medialis m.
Vastus lateralis m.
Sartorius m.
Articularis genus m.
Saphenous n. and descending genicular a.
Lateral femoral intermuscular septum
Great saphenous v.
Femur
Gracilis m.
Biceps femoris m.
Adductor magnus tendon
Common fibular n.
Popliteal v. and a.
Tibial n.
Semimembranosus m.
Semitendinosus m.

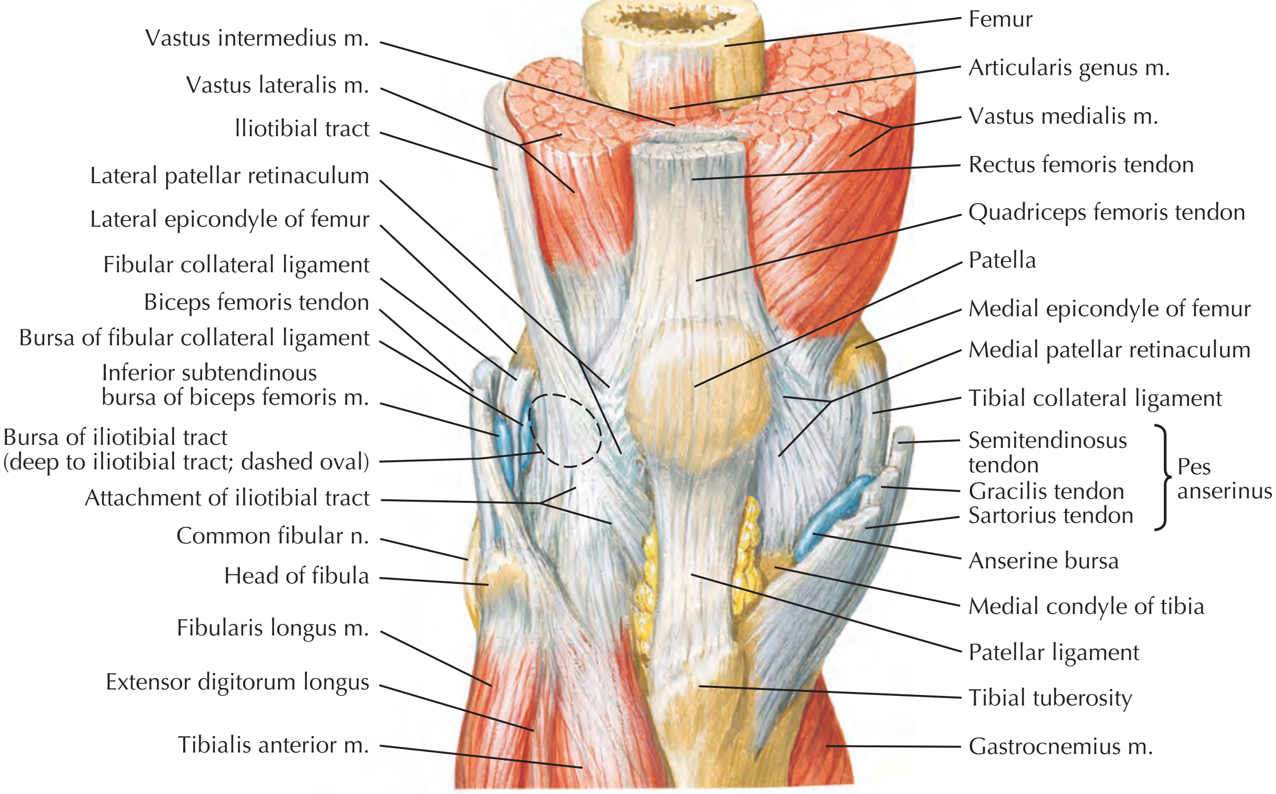
Medial view


Vastus medialis m.
Quadriceps femoris tendon
Medial epicondyle of femur
Patella
Medial patellar retinaculum
Knee joint capsule
Patellar ligament
Tibial tuberosity
Sartorius m. (*cut*)
Gracilis m. (*cut*)
Semitendinosus tendon (*cut*)
Semimembranosus m. and tendon
Adductor magnus tendon
Tibial collateral ligament
Semimembranosus bursa
Anserine bursa
Semitendinosus tendon
Gracilis tendon
Sartorius tendon
Pes anserinus
Gastrocnemius m.
Soleus m.

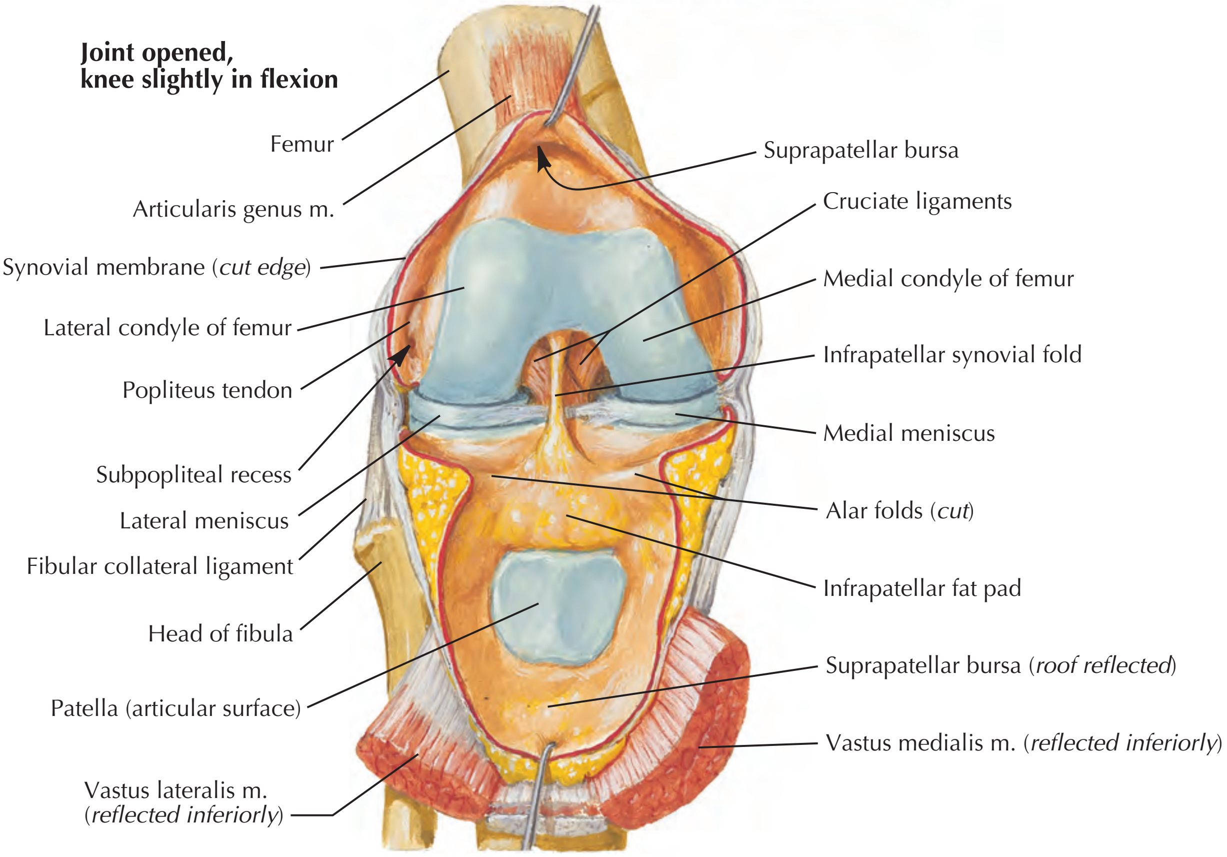
Lateral view


Iliotibial tract (*cut*)
Biceps femoris m. (*cut*)
Long head
Short head
Bursa of iliotibial tract
Fibular collateral ligament
Bursa of fibular collateral ligament
Plantaris m.
Inferior subtendinous bursa of biceps femoris m.
Biceps femoris tendon
Common fibular n.
Head of fibula
Gastrocnemius m.
Soleus m.
Fibularis longus m.
Vastus lateralis m.
Quadriceps femoris tendon
Patella
Lateral patellar retinaculum
Knee joint capsule
Patellar ligament
Tibial tuberosity
Tibialis anterior m.

Right knee in extension

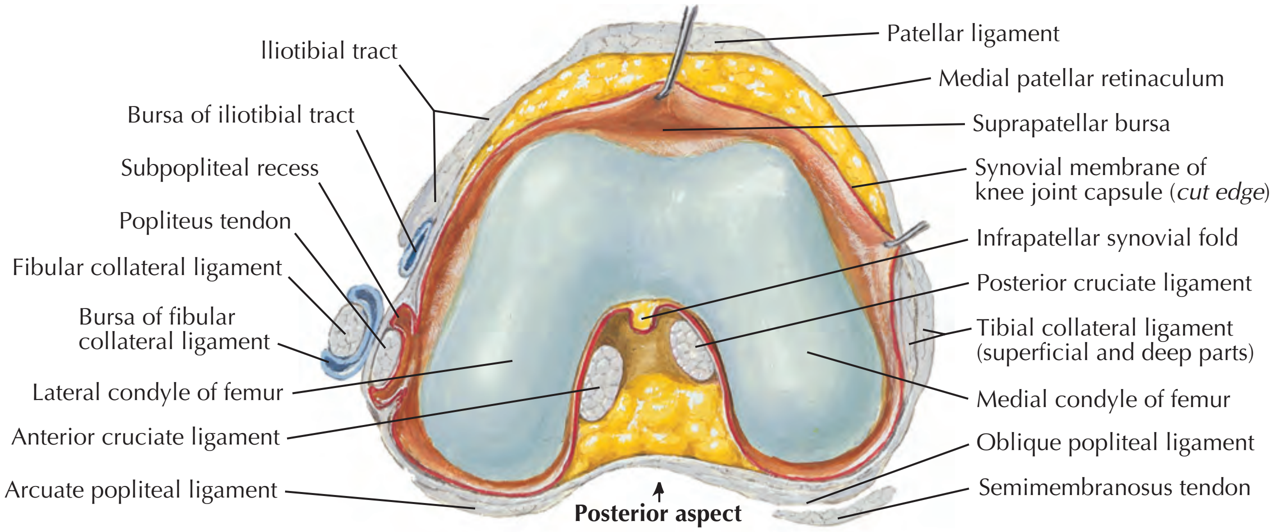

Vastus intermedius m.
Vastus lateralis m.
Iliotibial tract
Lateral patellar retinaculum
Lateral epicondyle of femur
Fibular collateral ligament
Biceps femoris tendon
Bursa of fibular collateral ligament
Inferior subtendinous bursa of biceps femoris m.
Bursa of iliotibial tract (deep to iliotibial tract; dashed oval)
Attachment of iliotibial tract
Common fibular n.
Head of fibula
Fibularis longus m.
Extensor digitorum longus
Tibialis anterior m.
Femur
Articularis genus m.
Vastus medialis m.
Rectus femoris tendon
Quadriceps femoris tendon
Patella
Medial epicondyle of femur
Medial patellar retinaculum
Tibial collateral ligament
Semitendinosus tendon
Gracilis tendon
Sartorius tendon
Pes anserinus
Anserine bursa
Medial condyle of tibia
Patellar ligament
Tibial tuberosity
Gastrocnemius m.

Joint opened, knee slightly in flexion

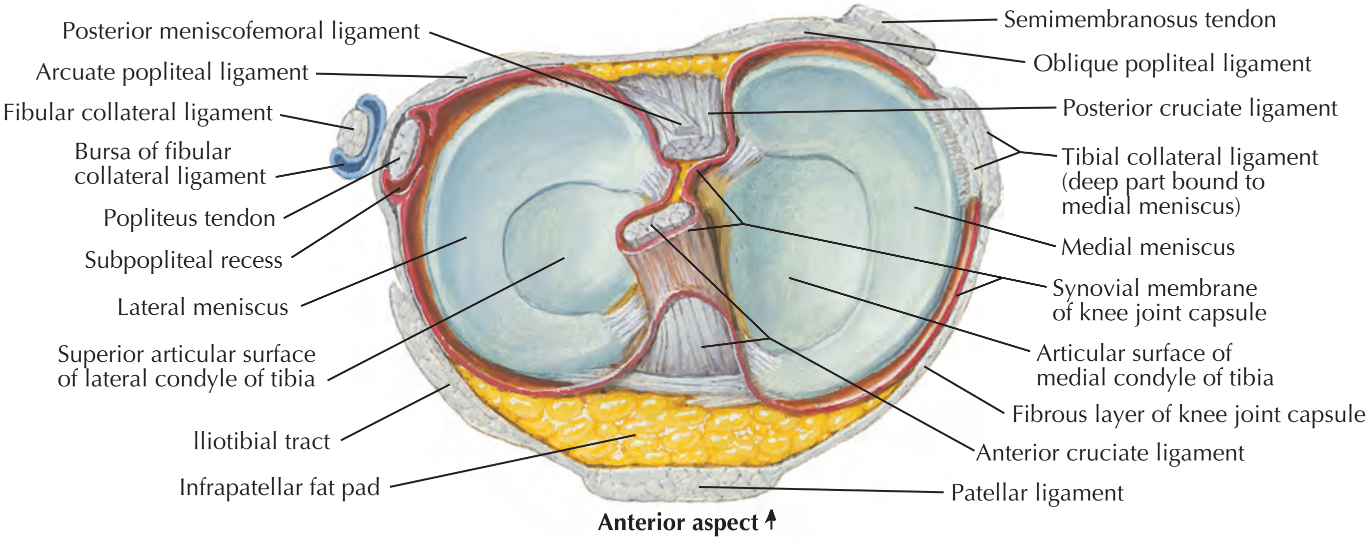

Femur
Articularis genus m.
Synovial membrane (*cut edge*)
Lateral condyle of femur
Popliteus tendon
Subpopliteal recess
Lateral meniscus
Fibular collateral ligament
Head of fibula
Patella (articular surface)
Vastus lateralis m. (*reflected inferiorly*)
Suprapatellar bursa
Cruciate ligaments
Medial condyle of femur
Infrapatellar synovial fold
Medial meniscus
Alar folds (*cut*)
Infrapatellar fat pad
Suprapatellar bursa (*roof reflected*)
Vastus medialis m. (*reflected inferiorly*)
F. Netter M.D.

See also **Plate 525**

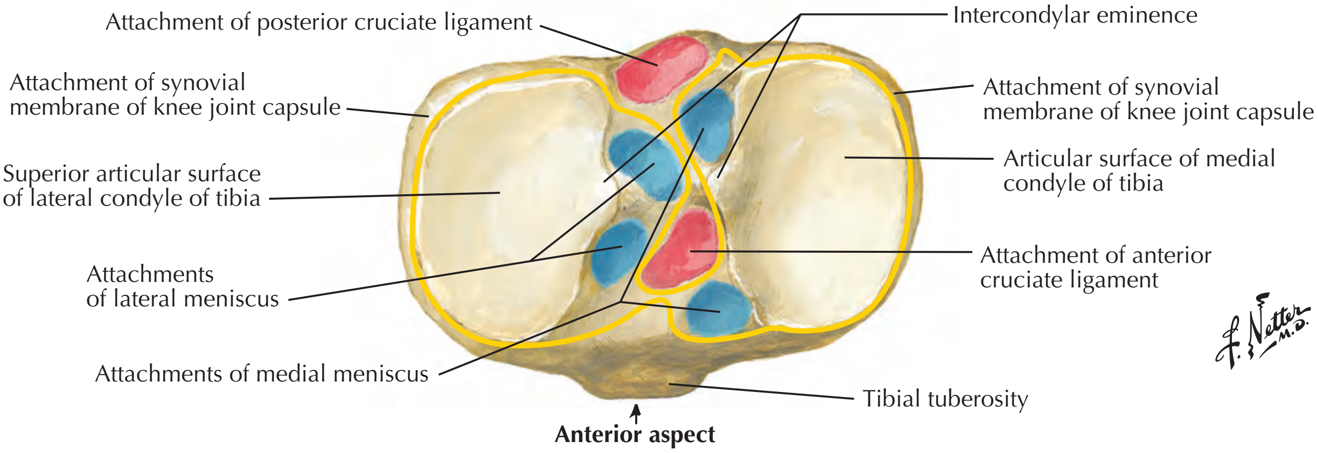
Inferior view


Iliotibial tract
Bursa of iliotibial tract
Subpopliteal recess
Popliteus tendon
Fibular collateral ligament
Bursa of fibular collateral ligament
Lateral condyle of femur
Anterior cruciate ligament
Arcuate popliteal ligament
Posterior aspect
Patellar ligament
Medial patellar retinaculum
Suprapatellar bursa
Synovial membrane of knee joint capsule (*cut edge*)
Infrapatellar synovial fold
Posterior cruciate ligament
Tibial collateral ligament (superficial and deep parts)
Medial condyle of femur
Oblique popliteal ligament
Semimembranosus tendon

Superior view

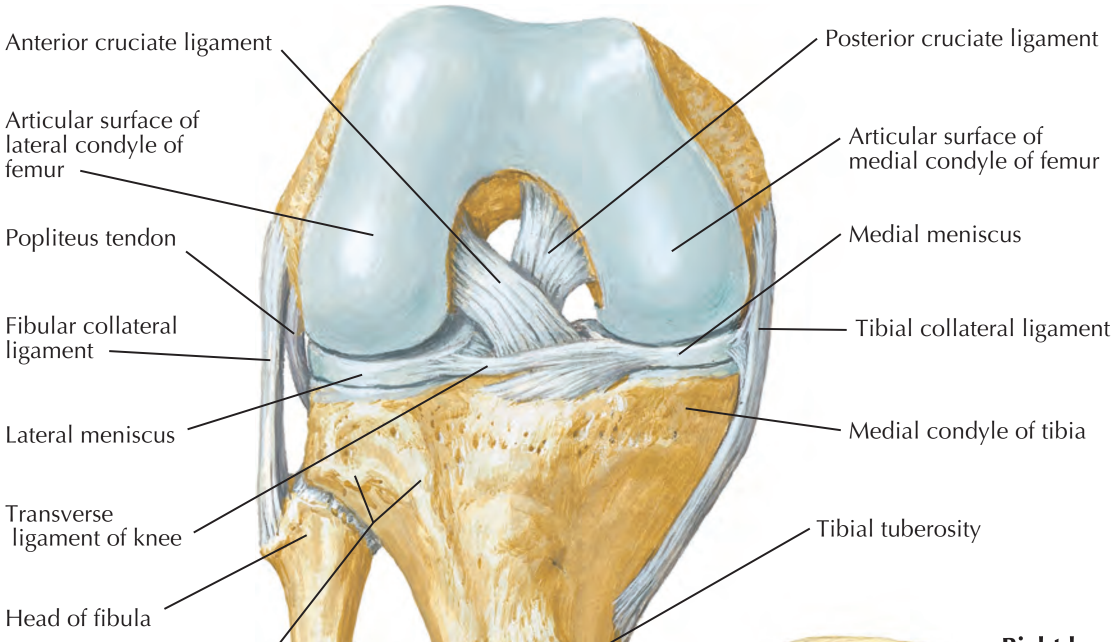

Posterior meniscofemoral ligament
Arcuate popliteal ligament
Fibular collateral ligament
Bursa of fibular collateral ligament
Popliteus tendon
Subpopliteal recess
Lateral meniscus
Superior articular surface of lateral condyle of tibia
Iliotibial tract
Infrapatellar fat pad
Anterior aspect
Semimembranosus tendon
Oblique popliteal ligament
Posterior cruciate ligament
Tibial collateral ligament (deep part bound to medial meniscus)
Medial meniscus
Synovial membrane of knee joint capsule
Articular surface of medial condyle of tibia
Fibrous layer of knee joint capsule
Anterior cruciate ligament
Patellar ligament

Superior view: ligaments and cartilage removed

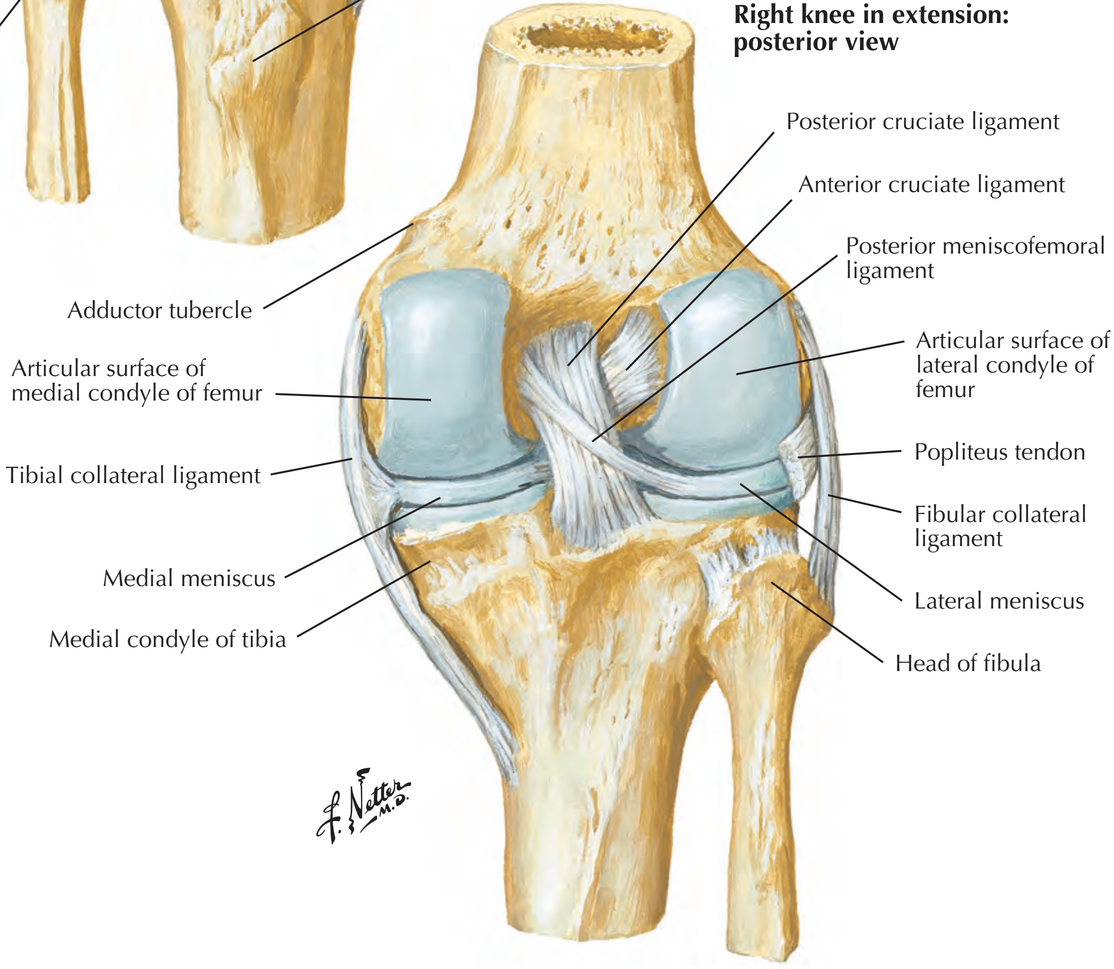

Attachment of posterior cruciate ligament
Attachment of synovial membrane of knee joint capsule
Superior articular surface of lateral condyle of tibia
Attachments of lateral meniscus
Attachments of medial meniscus
Anterior aspect
Intercondylar eminence
Attachment of synovial membrane of knee joint capsule
Articular surface of medial condyle of tibia
Attachment of anterior cruciate ligament
Tibial tuberosity

See also Plate BP 107

Right knee in flexion: anterior view

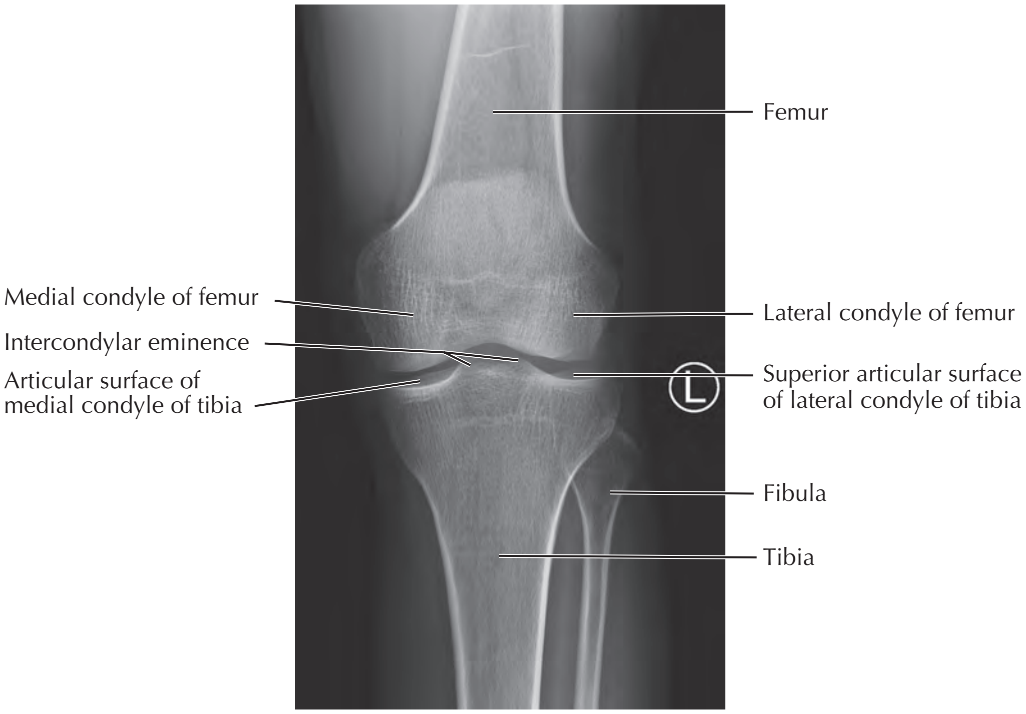

Anterior cruciate ligament
Articular surface of lateral condyle of femur
Popliteus tendon
Fibular collateral ligament
Lateral meniscus
Transverse ligament of knee
Head of fibula
Tubercle of iliotibial tract (Gerdy's)
Posterior cruciate ligament
Articular surface of medial condyle of femur
Medial meniscus
Tibial collateral ligament
Medial condyle of tibia
Tibial tuberosity

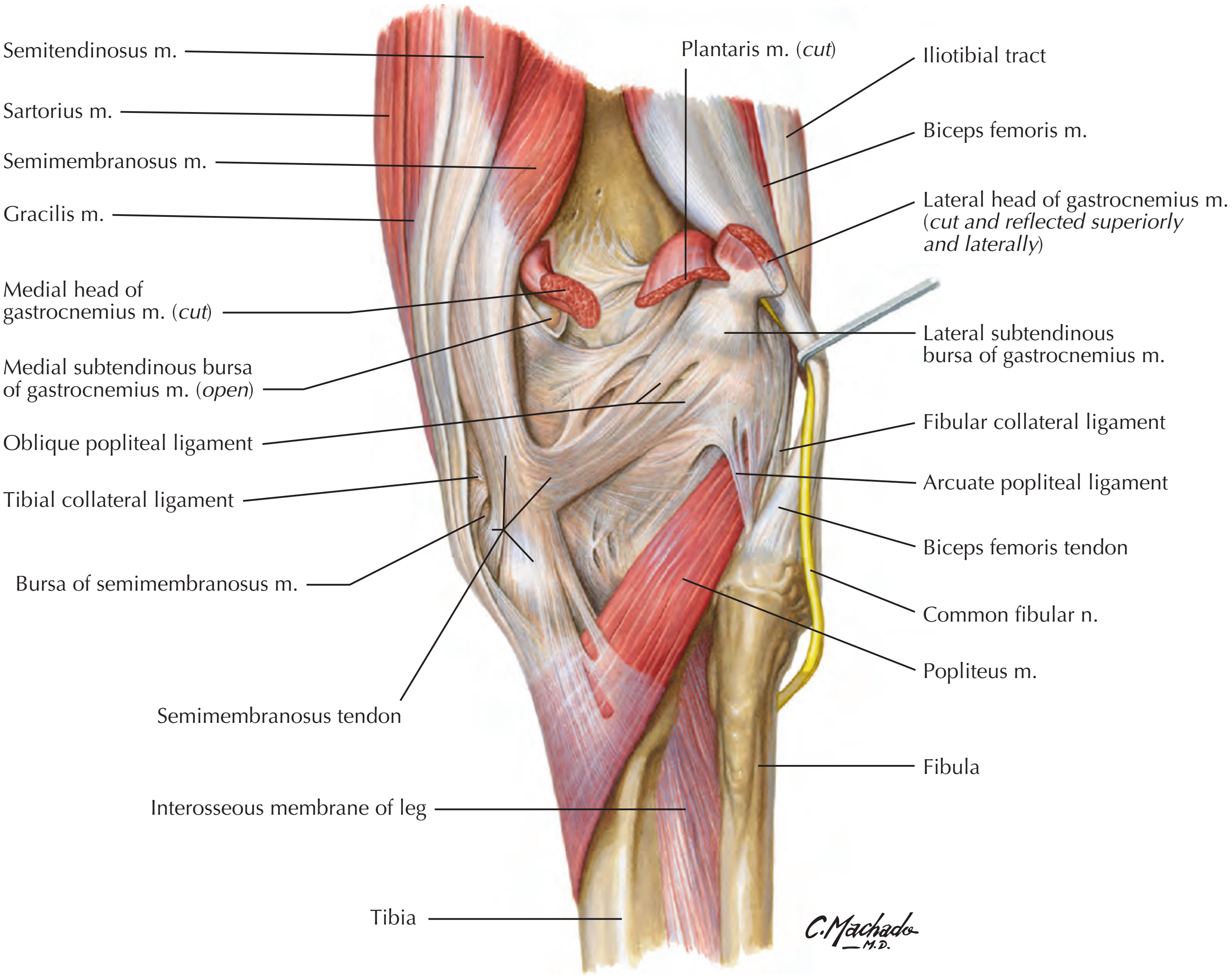
Right knee in extension: posterior view


Posterior cruciate ligament
Anterior cruciate ligament
Posterior meniscofemoral ligament
Articular surface of lateral condyle of femur
Popliteus tendon
Fibular collateral ligament
Lateral meniscus
Head of fibula
Adductor tubercle
Articular surface of medial condyle of femur
Tibial collateral ligament
Medial meniscus
Medial condyle of tibia
F. Netter M.D.

Knee: Anteroposterior Radiograph and Posterior View

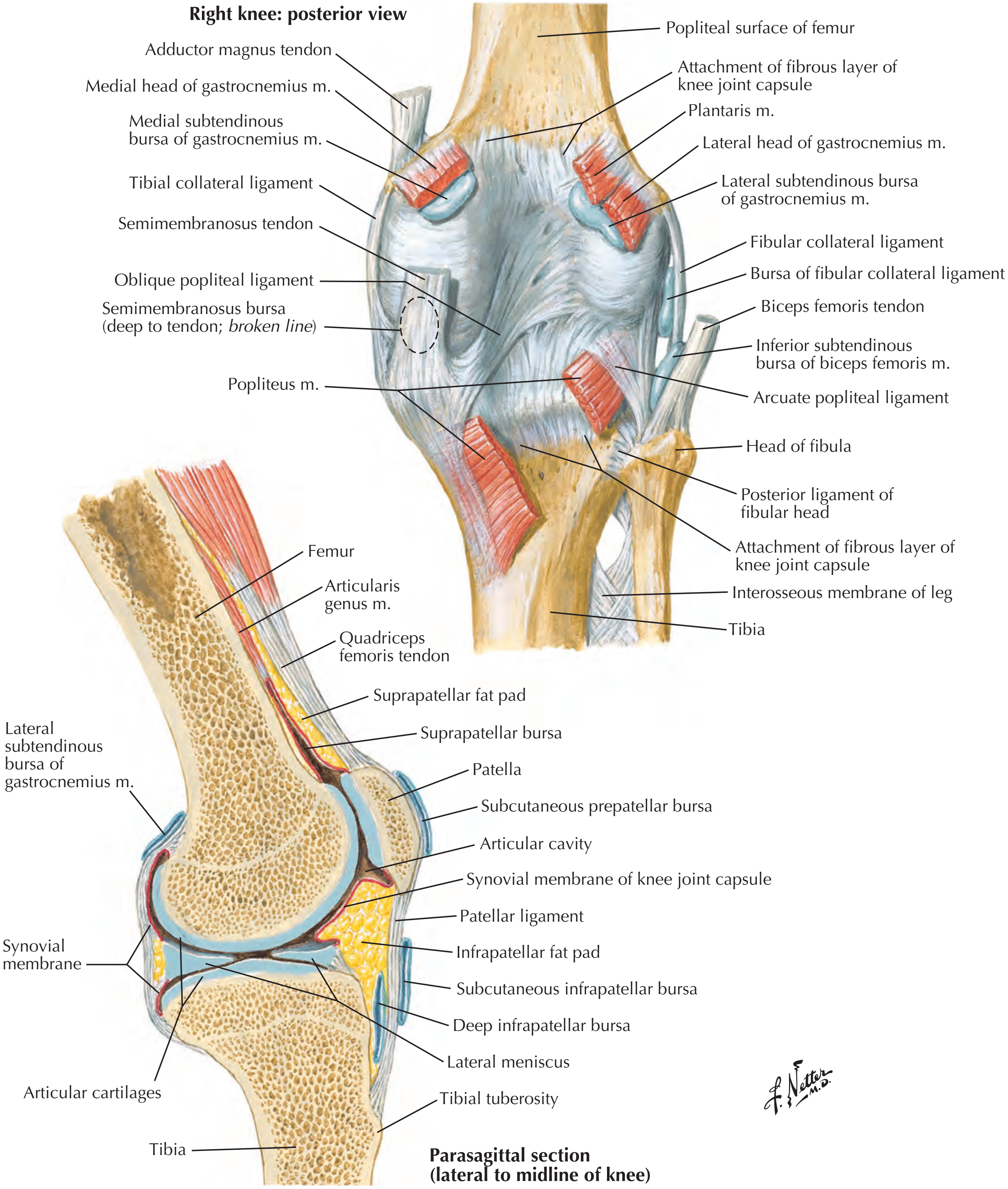
See also **Plates 517, BP 107**


Femur
Medial condyle of femur
Lateral condyle of femur
Intercondylar eminence
Articular surface of medial condyle of tibia
Superior articular surface of lateral condyle of tibia
L
Fibula
Tibia


Semitendinosus m.
Sartorius m.
Semimembranosus m.
Gracilis m.
Medial head of gastrocnemius m. (*cut*)
Medial subtendinous bursa of gastrocnemius m. (*open*)
Oblique popliteal ligament
Tibial collateral ligament
Bursa of semimembranosus m.
Semimembranosus tendon
Interosseous membrane of leg
Tibia
Plantaris m. (*cut*)
Iliotibial tract
Biceps femoris m.
Lateral head of gastrocnemius m. (*cut and reflected superiorly and laterally*)
Lateral subtendinous bursa of gastrocnemius m.
Fibular collateral ligament
Arcuate popliteal ligament
Biceps femoris tendon
Common fibular n.
Popliteus m.
Fibula
C.Machado M.D.

Knee: Posterior and Sagittal Views

See also **Plates BP 107, BP 108**


Right knee: posterior view

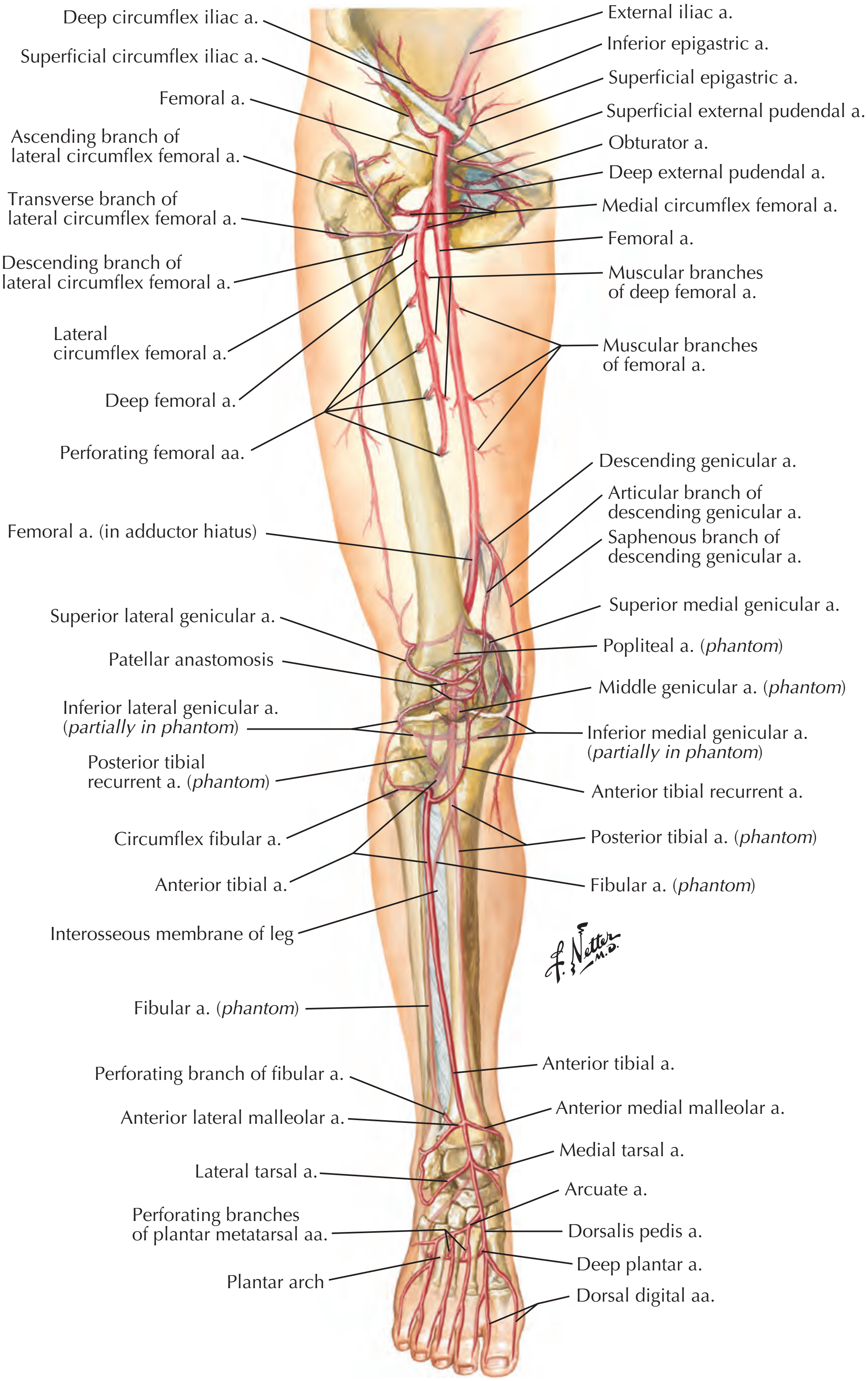
Popliteal surface of femur
Adductor magnus tendon
Attachment of fibrous layer of knee joint capsule
Medial head of gastrocnemius m.
Plantaris m.
Medial subtendinous bursa of gastrocnemius m.
Lateral head of gastrocnemius m.
Lateral subtendinous bursa of gastrocnemius m.
Tibial collateral ligament
Semimembranosus tendon
Fibular collateral ligament
Bursa of fibular collateral ligament
Oblique popliteal ligament
Biceps femoris tendon
Semimembranosus bursa (deep to tendon; *broken line*)
Inferior subtendinous bursa of biceps femoris m.
Popliteus m.
Arcuate popliteal ligament
Head of fibula
Posterior ligament of fibular head
Attachment of fibrous layer of knee joint capsule
Interosseous membrane of leg
Tibia

Parasagittal section (lateral to midline of knee)

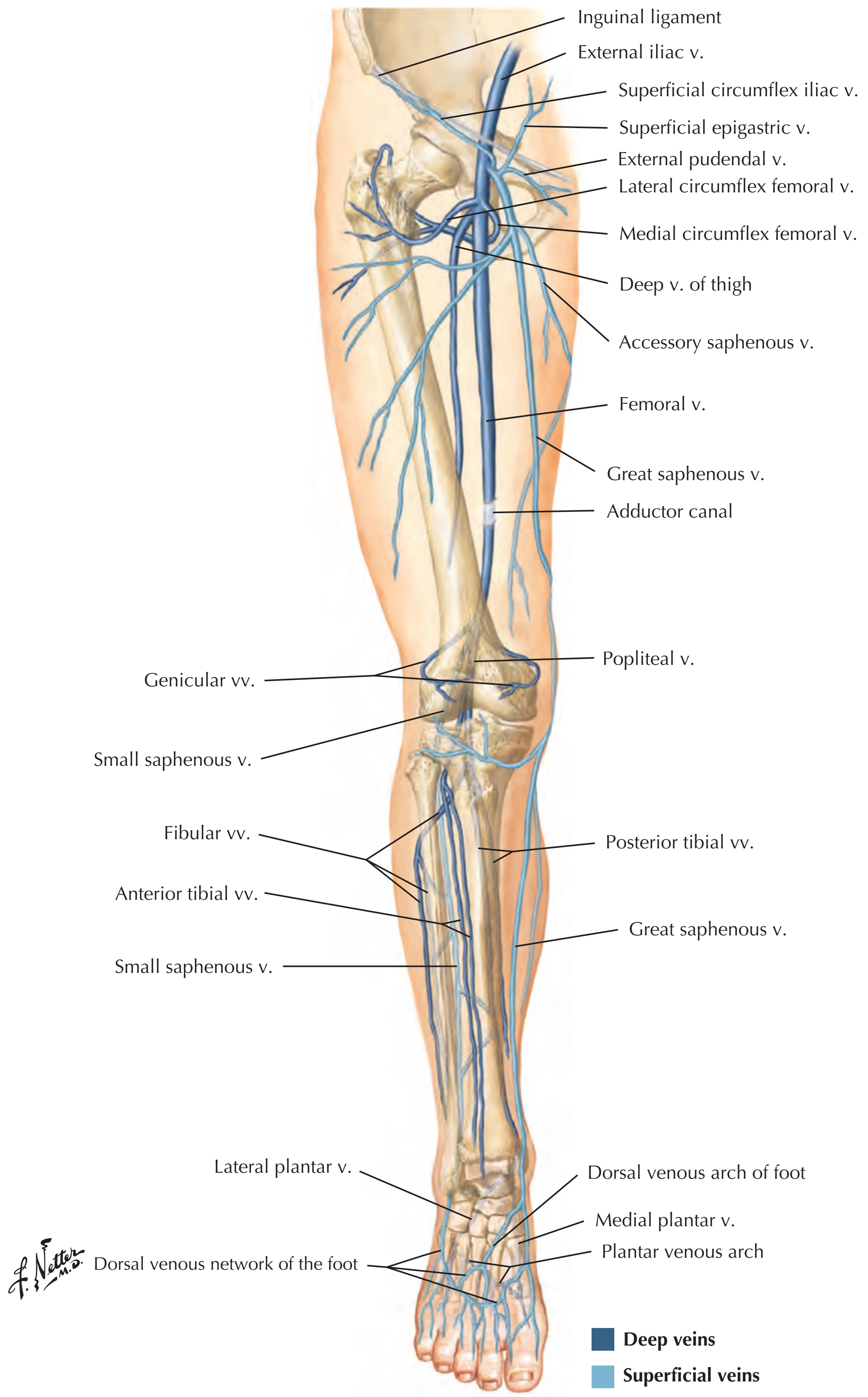
Femur
Articularis genus m.
Quadriceps femoris tendon
Suprapatellar fat pad
Lateral subtendinous bursa of gastrocnemius m.
Suprapatellar bursa
Patella
Subcutaneous prepatellar bursa
Articular cavity
Synovial membrane of knee joint capsule
Patellar ligament
Synovial membrane
Infrapatellar fat pad
Subcutaneous infrapatellar bursa
Deep infrapatellar bursa
Lateral meniscus
Articular cartilages
Tibial tuberosity
Tibia
F. Netter M.D.

Arteries of Lower Limb

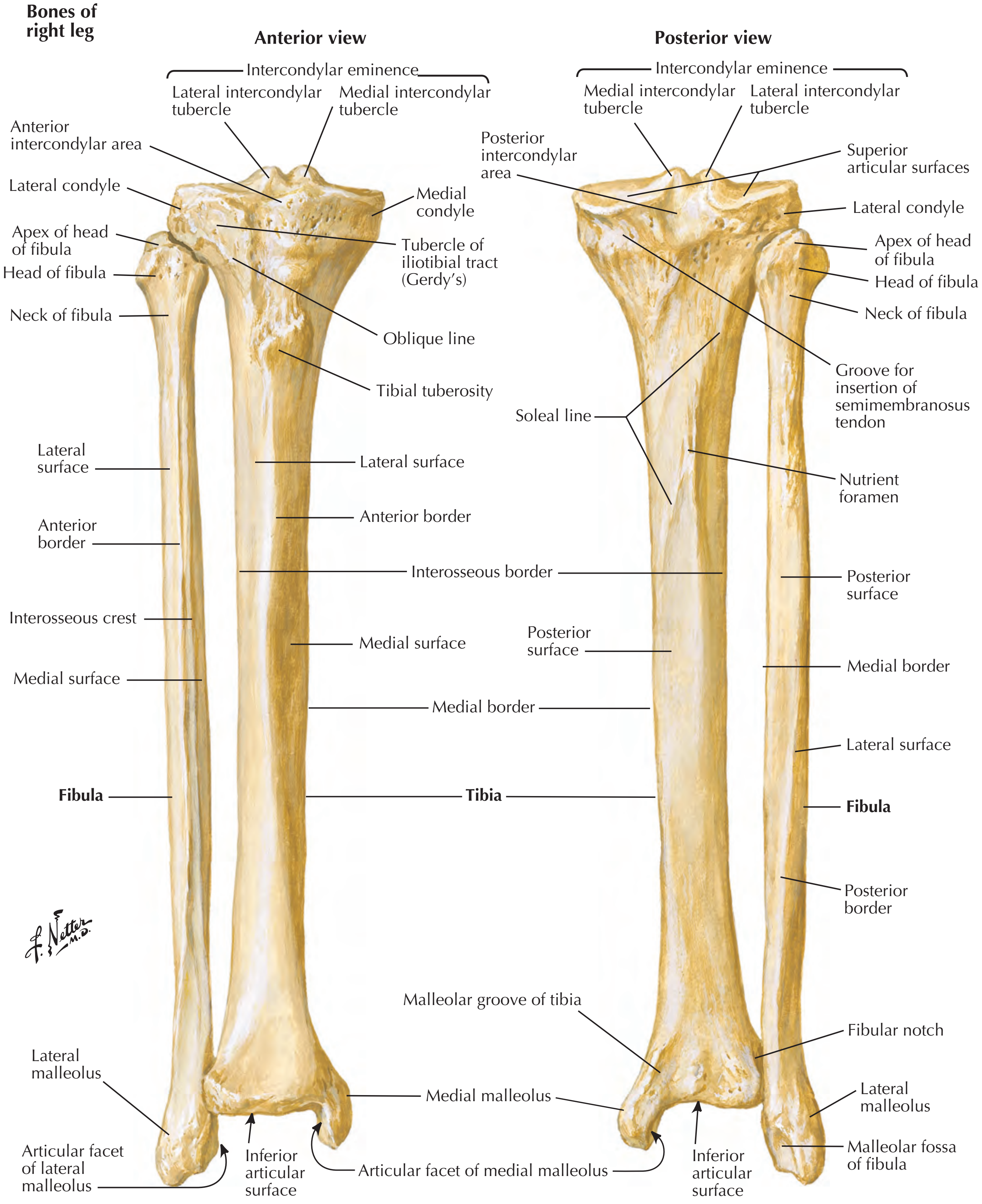
See also **Plates 514, 532, BP 103**


Deep circumflex iliac a.
Superficial circumflex iliac a.
Femoral a.
Ascending branch of lateral circumflex femoral a.
Transverse branch of lateral circumflex femoral a.
Descending branch of lateral circumflex femoral a.
Lateral circumflex femoral a.
Deep femoral a.
Perforating femoral aa.
Femoral a. (in adductor hiatus)
Superior lateral genicular a.
Patellar anastomosis
Inferior lateral genicular a. (*partially in phantom*)
Posterior tibial recurrent a. (*phantom*)
Circumflex fibular a.
Anterior tibial a.
Interosseous membrane of leg
Fibular a. (*phantom*)
Perforating branch of fibular a.
Anterior lateral malleolar a.
Lateral tarsal a.
Perforating branches of plantar metatarsal aa.
Plantar arch
External iliac a.
Inferior epigastric a.
Superficial epigastric a.
Superficial external pudendal a.
Obturator a.
Deep external pudendal a.
Medial circumflex femoral a.
Femoral a.
Muscular branches of deep femoral a.
Muscular branches of femoral a.
Descending genicular a.
Articular branch of descending genicular a.
Saphenous branch of descending genicular a.
Superior medial genicular a.
Popliteal a. (*phantom*)
Middle genicular a. (*phantom*)
Inferior medial genicular a. (*partially in phantom*)
Anterior tibial recurrent a.
Posterior tibial a. (*phantom*)
Fibular a. (*phantom*)
Anterior tibial a.
Anterior medial malleolar a.
Medial tarsal a.
Arcuate a.
Dorsalis pedis a.
Deep plantar a.
Dorsal digital aa.

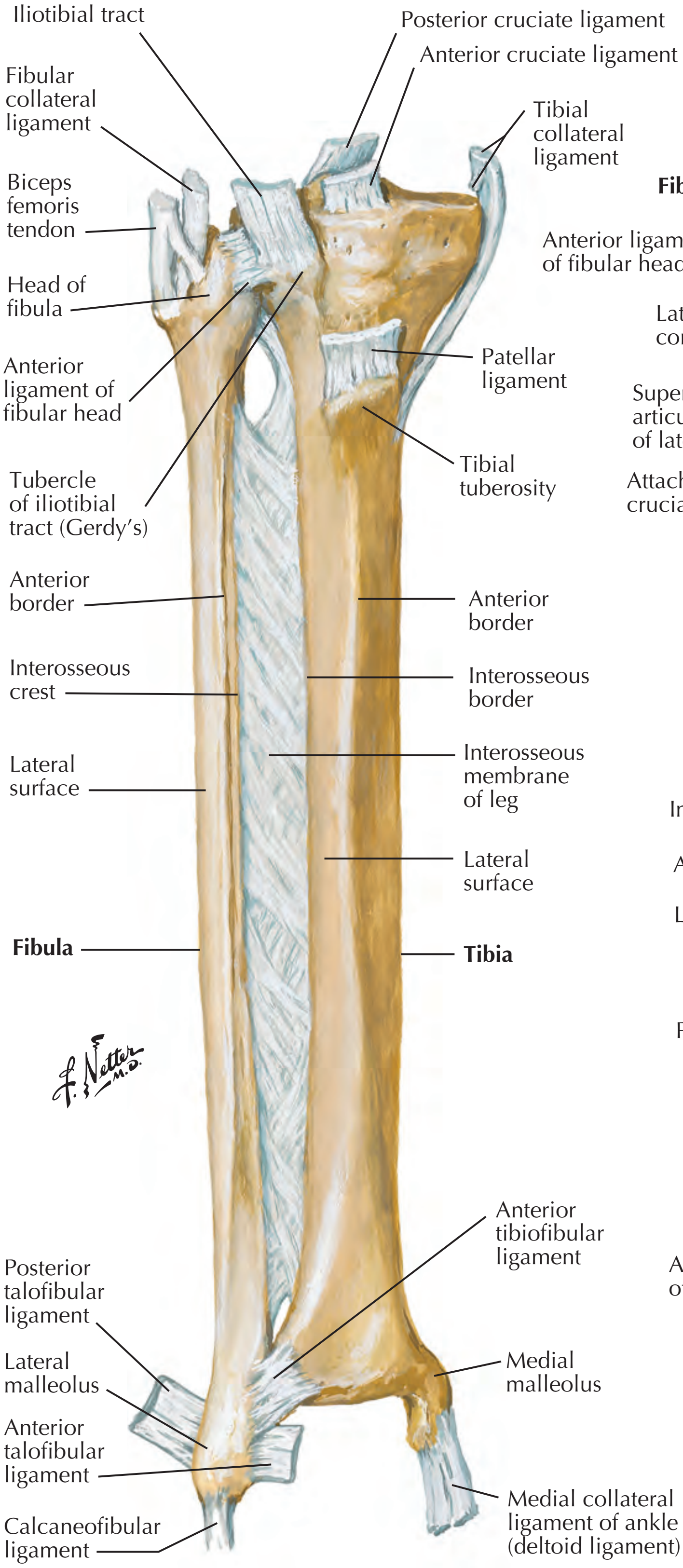
Veins of Lower Limb


Inguinal ligament
External iliac v.
Superficial circumflex iliac v.
Superficial epigastric v.
External pudendal v.
Lateral circumflex femoral v.
Medial circumflex femoral v.
Deep v. of thigh
Accessory saphenous v.
Femoral v.
Great saphenous v.
Adductor canal
Genicular vv.
Popliteal v.
Small saphenous v.
Fibular vv.
Posterior tibial vv.
Anterior tibial vv.
Great saphenous v.
Small saphenous v.
Lateral plantar v.
Dorsal venous arch of foot
Medial plantar v.
Plantar venous arch
Dorsal venous network of the foot
Deep veins
Superficial veins

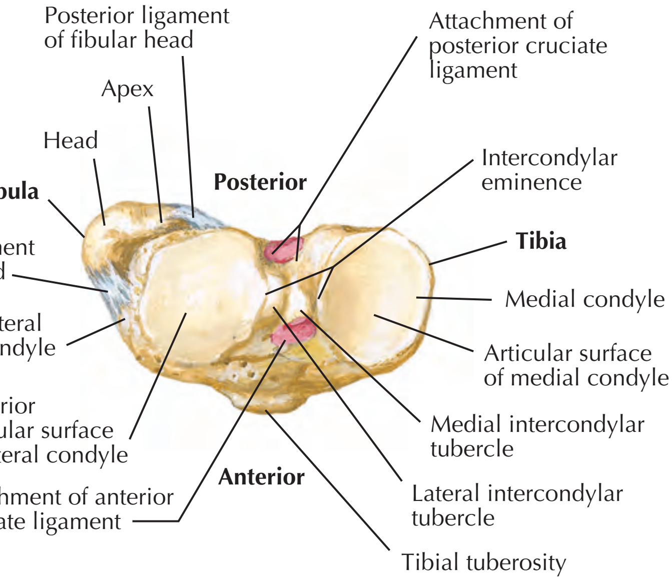
Tibia and Fibula: Anterior and Posterior Views


Bones of right leg
Anterior view
Intercondylar eminence
Lateral intercondylar tubercle
Medial intercondylar tubercle
Anterior intercondylar area
Lateral condyle
Medial condyle
Apex of head of fibula
Head of fibula
Tubercle of iliotibial tract (Gerdy's)
Neck of fibula
Oblique line
Tibial tuberosity
Lateral surface
Lateral surface
Anterior border
Anterior border
Interosseous border
Interosseous crest
Medial surface
Medial surface
Medial border
Fibula
Tibia
Lateral malleolus
Medial malleolus
Articular facet of lateral malleolus
Inferior articular surface
Articular facet of medial malleolus
Posterior view
Intercondylar eminence
Medial intercondylar tubercle
Lateral intercondylar tubercle
Posterior intercondylar area
Superior articular surfaces
Lateral condyle
Apex of head of fibula
Head of fibula
Neck of fibula
Groove for insertion of semimembranosus tendon
Soleal line
Nutrient foramen
Posterior surface
Posterior surface
Medial border
Lateral surface
Fibula
Posterior border
Malleolar groove of tibia
Fibular notch
Lateral malleolus
Malleolar fossa of fibula
Inferior articular surface

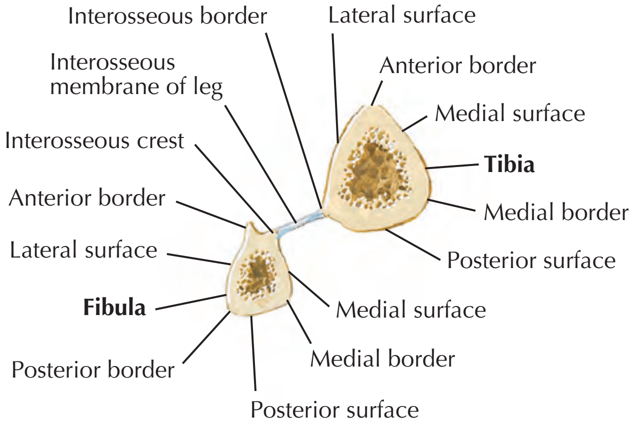
Anterior view with ligament attachments


Iliotibial tract
Posterior cruciate ligament
Anterior cruciate ligament
Fibular collateral ligament
Tibial collateral ligament
Biceps femoris tendon
Head of fibula
Anterior ligament of fibular head
Patellar ligament
Tibial tuberosity
Tubercle of iliotibial tract (Gerdy's)
Anterior border
Anterior border
Interosseous crest
Interosseous border
Interosseous membrane of leg
Lateral surface
Lateral surface
Fibula
Tibia
Anterior tibiofibular ligament
Posterior talofibular ligament
Lateral malleolus
Medial malleolus
Anterior talofibular ligament
Medial collateral ligament of ankle (deltoid ligament)
Calcaneofibular ligament

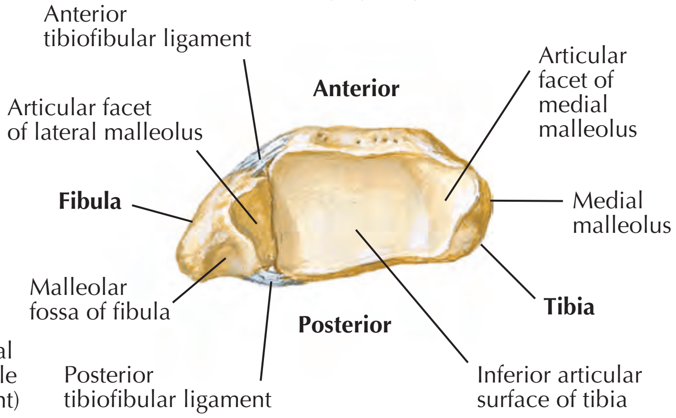
Superior view


Posterior ligament of fibular head
Attachment of posterior cruciate ligament
Apex
Head
Posterior
Intercondylar eminence
Fibula
Tibia
Anterior ligament of fibular head
Medial condyle
Lateral condyle
Articular surface of medial condyle
Superior articular surface of lateral condyle
Medial intercondylar tubercle
Anterior
Attachment of anterior cruciate ligament
Lateral intercondylar tubercle
Tibial tuberosity

Cross section

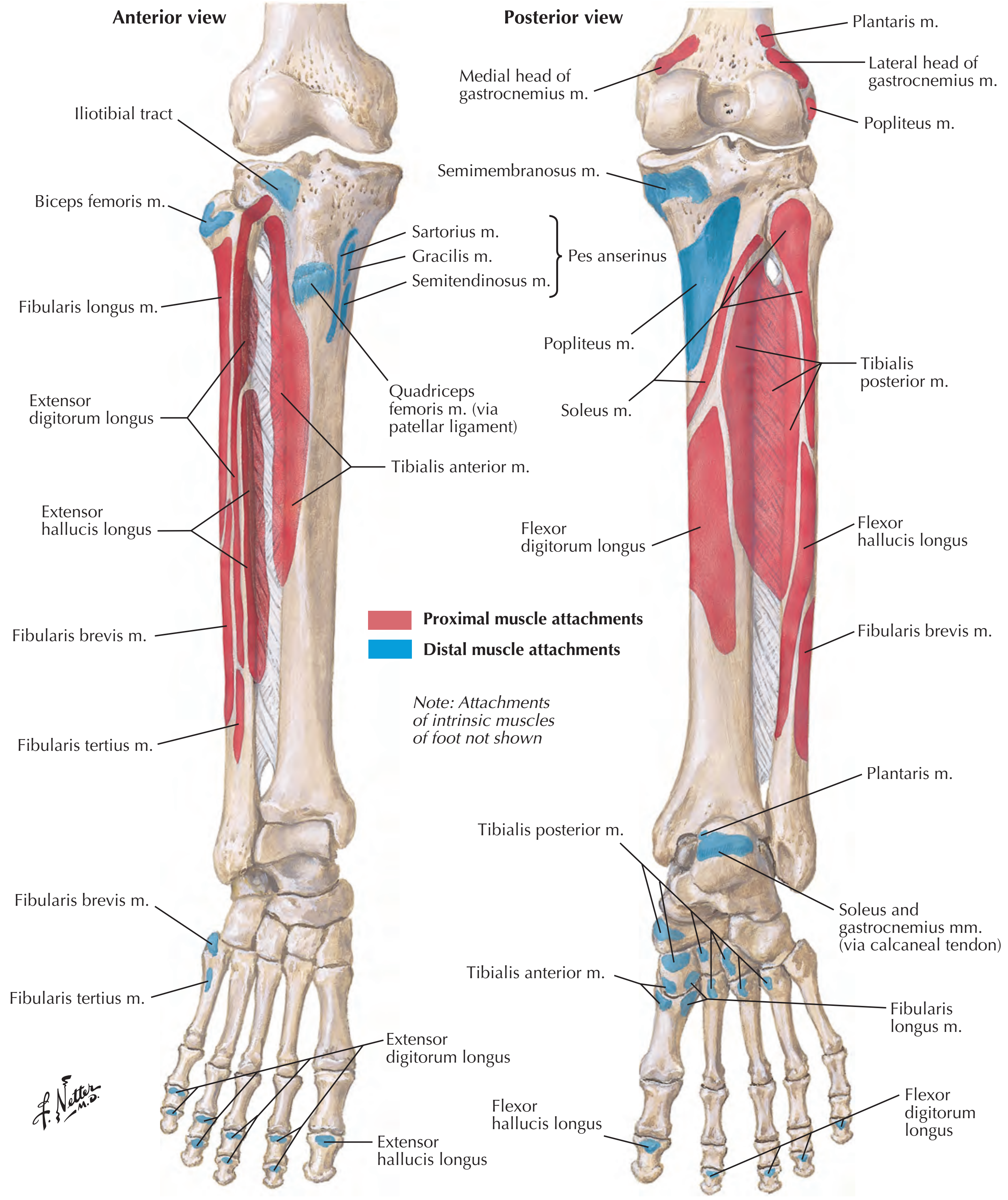

Interosseous border
Lateral surface
Interosseous membrane of leg
Anterior border
Medial surface
Interosseous crest
Tibia
Anterior border
Medial border
Lateral surface
Posterior surface
Fibula
Medial surface
Posterior border
Medial border
Posterior surface

Inferior view


Anterior tibiofibular ligament
Anterior
Articular facet of medial malleolus
Articular facet of lateral malleolus
Fibula
Medial malleolus
Malleolar fossa of fibula
Tibia
Posterior
Posterior tibiofibular ligament
Inferior articular surface of tibia

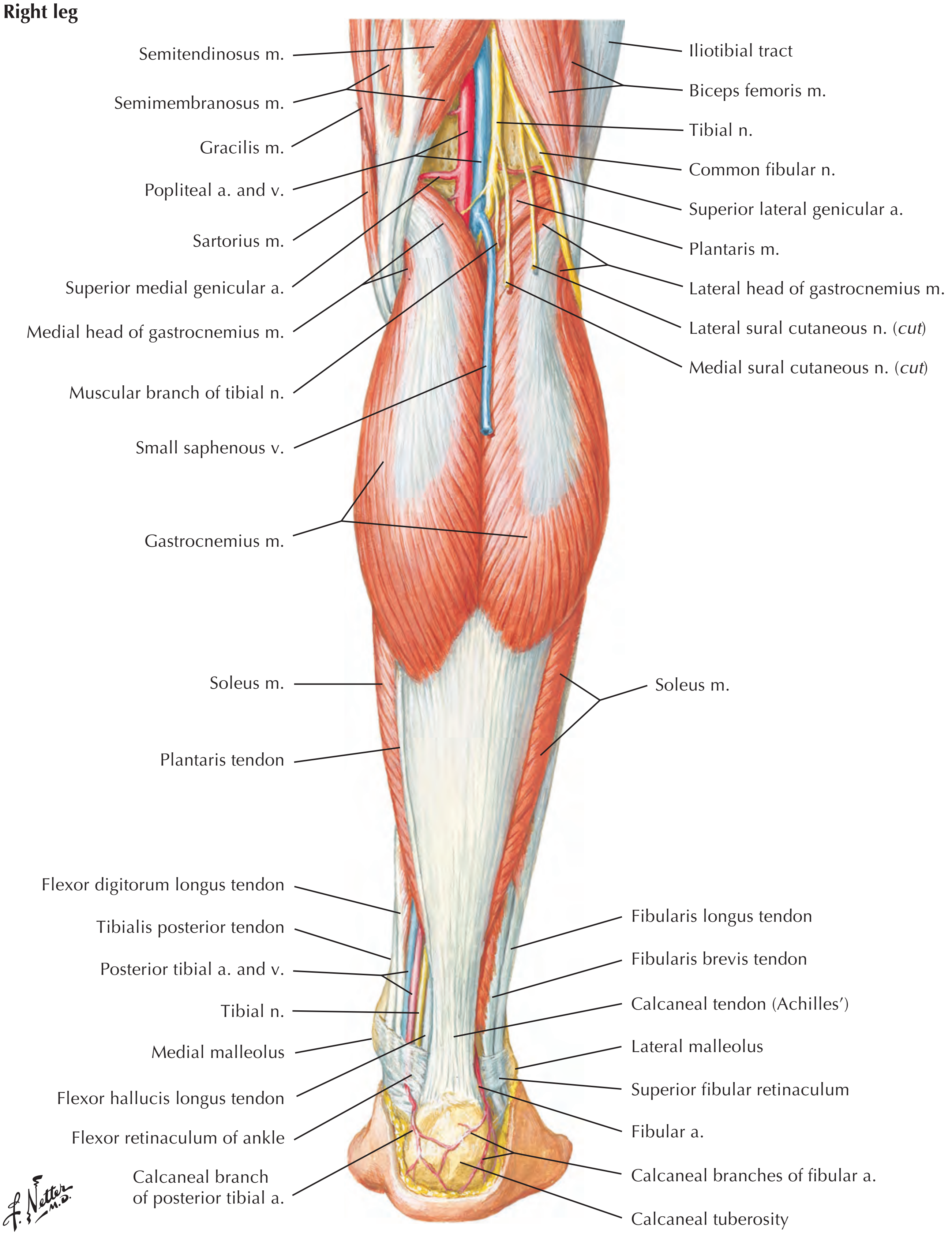
Attachments of Muscles of Leg

See also **Plates 529, 532**


Anterior view
Iliotibial tract
Biceps femoris m.
Fibularis longus m.
Extensor digitorum longus
Extensor hallucis longus
Fibularis brevis m.
Fibularis tertius m.
Fibularis brevis m.
Fibularis tertius m.
Sartorius m.
Gracilis m.
Semitendinosus m.
Pes anserinus
Quadriceps femoris m. (via patellar ligament)
Tibialis anterior m.
Extensor digitorum longus
Extensor hallucis longus
Posterior view
Plantaris m.
Medial head of gastrocnemius m.
Lateral head of gastrocnemius m.
Popliteus m.
Semimembranosus m.
Popliteus m.
Soleus m.
Tibialis posterior m.
Flexor digitorum longus
Flexor hallucis longus
Fibularis brevis m.
🟥 **Proximal muscle attachments**
🟦 **Distal muscle attachments**
Note: Attachments of intrinsic muscles of foot not shown
Plantaris m.
Tibialis posterior m.
Soleus and gastrocnemius mm. (via calcaneal tendon)
Tibialis anterior m.
Fibularis longus m.
Flexor hallucis longus
Flexor digitorum longus

See also **Plates 553, BP 106**

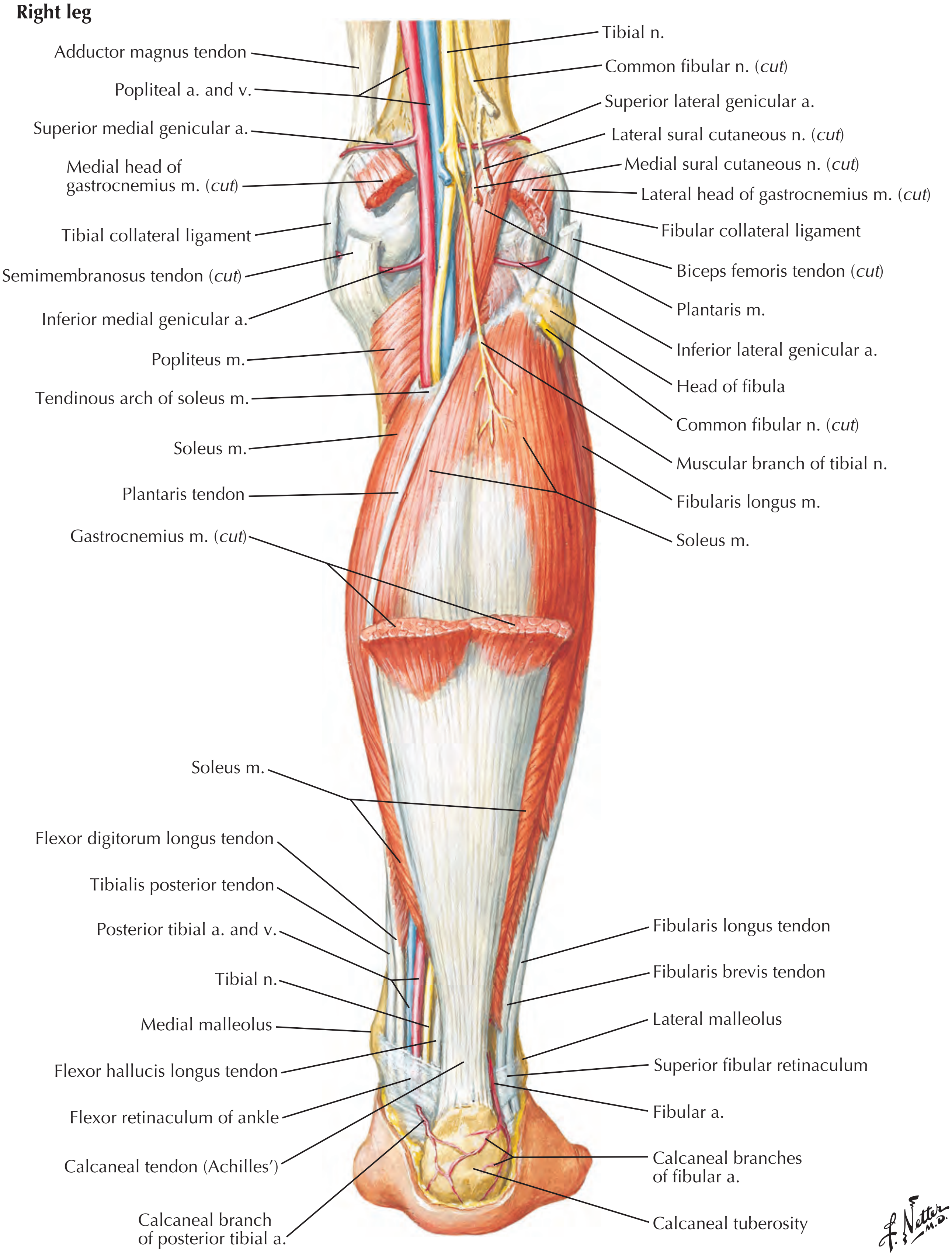
Right leg


Semitendinosus m.
Semimembranosus m.
Gracilis m.
Popliteal a. and v.
Sartorius m.
Superior medial genicular a.
Medial head of gastrocnemius m.
Muscular branch of tibial n.
Small saphenous v.
Gastrocnemius m.
Soleus m.
Plantaris tendon
Flexor digitorum longus tendon
Tibialis posterior tendon
Posterior tibial a. and v.
Tibial n.
Medial malleolus
Flexor hallucis longus tendon
Flexor retinaculum of ankle
Calcaneal branch of posterior tibial a.
Iliotibial tract
Biceps femoris m.
Tibial n.
Common fibular n.
Superior lateral genicular a.
Plantaris m.
Lateral head of gastrocnemius m.
Lateral sural cutaneous n. (*cut*)
Medial sural cutaneous n. (*cut*)
Soleus m.
Fibularis longus tendon
Fibularis brevis tendon
Calcaneal tendon (Achilles')
Lateral malleolus
Superior fibular retinaculum
Fibular a.
Calcaneal branches of fibular a.
Calcaneal tuberosity
F. Netter M.D.

Muscles of Leg: Superficial Part of Posterior Compartment (Partial Dissection)

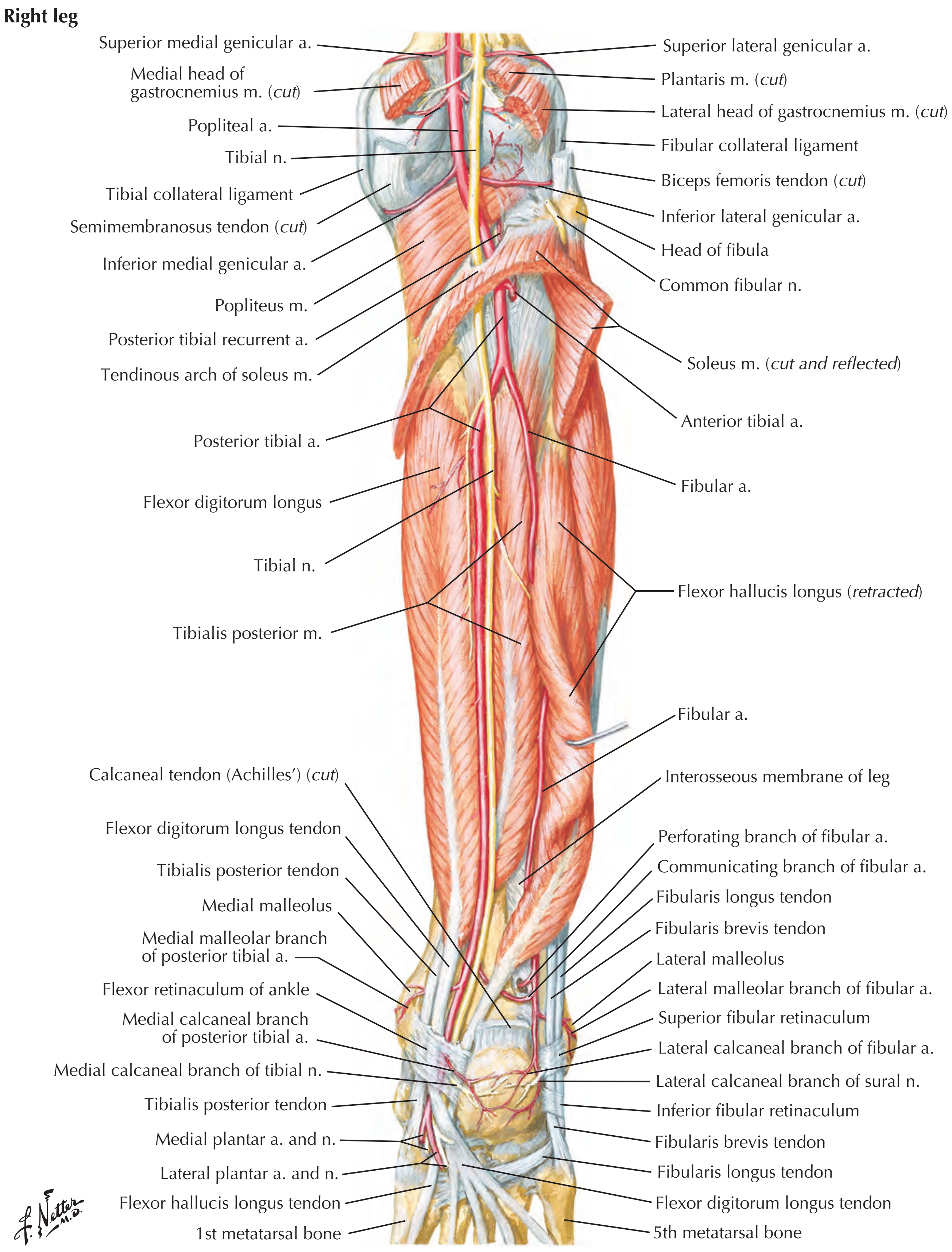
See also **Plates 553, BP 105, BP 106**

Right leg


Adductor magnus tendon
Popliteal a. and v.
Superior medial genicular a.
Medial head of gastrocnemius m. (*cut*)
Tibial collateral ligament
Semimembranosus tendon (*cut*)
Inferior medial genicular a.
Popliteus m.
Tendinous arch of soleus m.
Soleus m.
Plantaris tendon
Gastrocnemius m. (*cut*)
Tibial n.
Common fibular n. (*cut*)
Superior lateral genicular a.
Lateral sural cutaneous n. (*cut*)
Medial sural cutaneous n. (*cut*)
Lateral head of gastrocnemius m. (*cut*)
Fibular collateral ligament
Biceps femoris tendon (*cut*)
Plantaris m.
Inferior lateral genicular a.
Head of fibula
Common fibular n. (*cut*)
Muscular branch of tibial n.
Fibularis longus m.
Soleus m.
Soleus m.
Flexor digitorum longus tendon
Tibialis posterior tendon
Posterior tibial a. and v.
Tibial n.
Medial malleolus
Flexor hallucis longus tendon
Flexor retinaculum of ankle
Calcaneal tendon (Achilles')
Calcaneal branch of posterior tibial a.
Fibularis longus tendon
Fibularis brevis tendon
Lateral malleolus
Superior fibular retinaculum
Fibular a.
Calcaneal branches of fibular a.
Calcaneal tuberosity

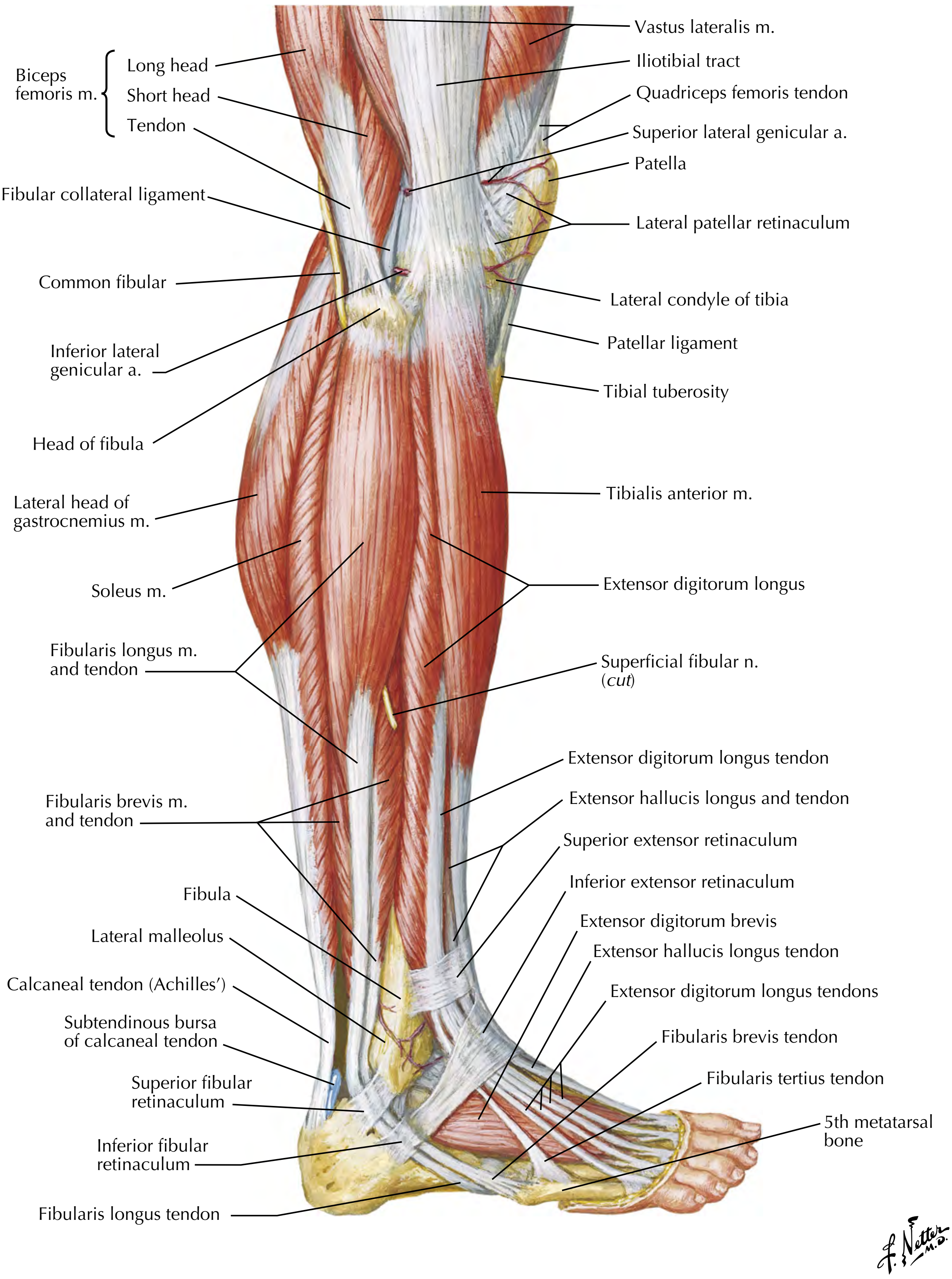
Muscles of Leg: Deep Part of Posterior Compartment

See also **Plates 553, BP 105, BP 106**

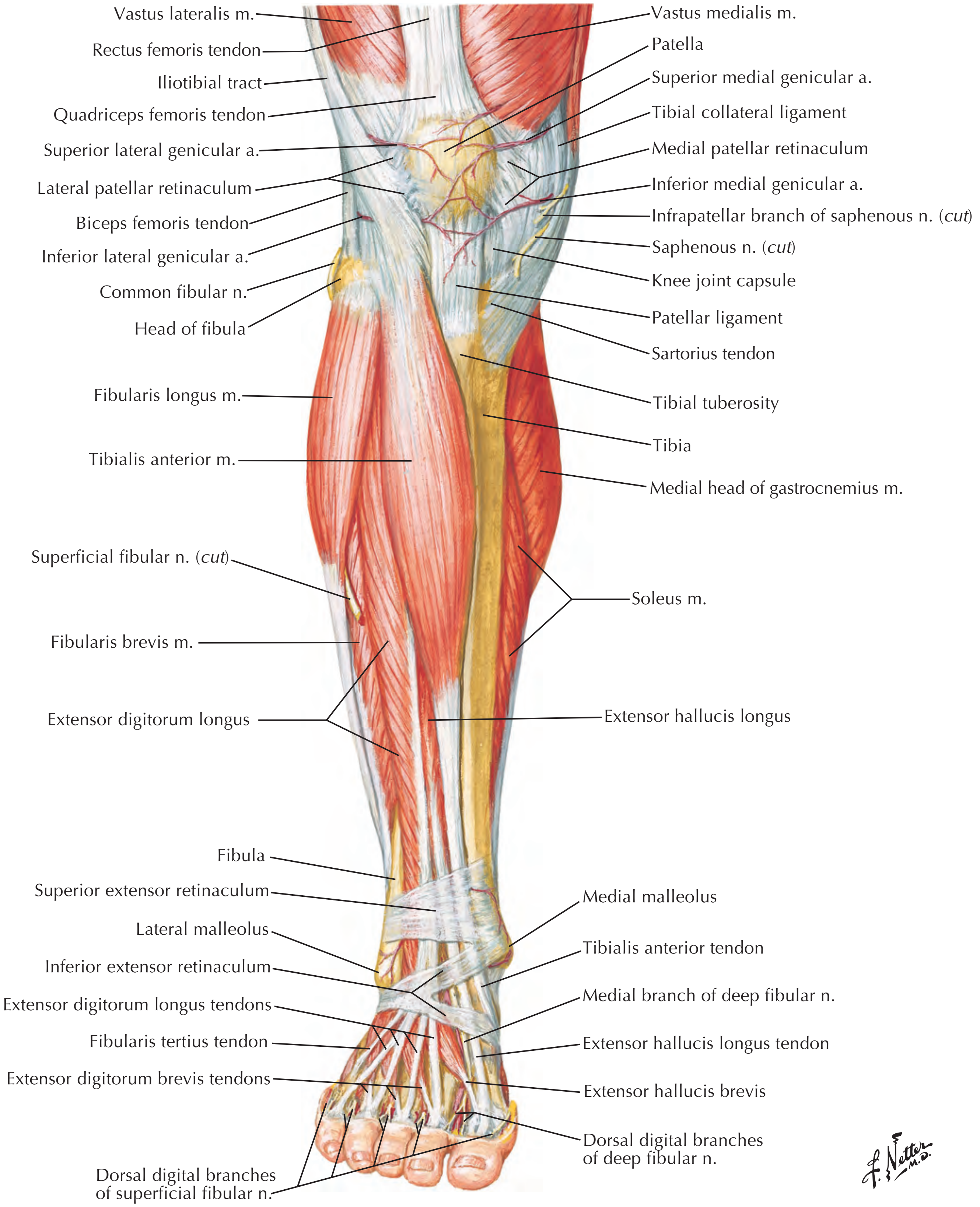

Right leg
Superior medial genicular a.
Medial head of gastrocnemius m. (*cut*)
Popliteal a.
Tibial n.
Tibial collateral ligament
Semimembranosus tendon (*cut*)
Inferior medial genicular a.
Popliteus m.
Posterior tibial recurrent a.
Tendinous arch of soleus m.
Posterior tibial a.
Flexor digitorum longus
Tibial n.
Tibialis posterior m.
Calcaneal tendon (Achilles') (*cut*)
Flexor digitorum longus tendon
Tibialis posterior tendon
Medial malleolus
Medial malleolar branch of posterior tibial a.
Flexor retinaculum of ankle
Medial calcaneal branch of posterior tibial a.
Medial calcaneal branch of tibial n.
Tibialis posterior tendon
Medial plantar a. and n.
Lateral plantar a. and n.
Flexor hallucis longus tendon
1st metatarsal bone
Superior lateral genicular a.
Plantaris m. (*cut*)
Lateral head of gastrocnemius m. (*cut*)
Fibular collateral ligament
Biceps femoris tendon (*cut*)
Inferior lateral genicular a.
Head of fibula
Common fibular n.
Soleus m. (*cut and reflected*)
Anterior tibial a.
Fibular a.
Flexor hallucis longus (*retracted*)
Fibular a.
Interosseous membrane of leg
Perforating branch of fibular a.
Communicating branch of fibular a.
Fibularis longus tendon
Fibularis brevis tendon
Lateral malleolus
Lateral malleolar branch of fibular a.
Superior fibular retinaculum
Lateral calcaneal branch of fibular a.
Lateral calcaneal branch of sural n.
Inferior fibular retinaculum
Fibularis brevis tendon
Fibularis longus tendon
Flexor digitorum longus tendon
5th metatarsal bone

Muscles of Leg: Lateral Compartment

See also **Plates 540, 554, BP 106**

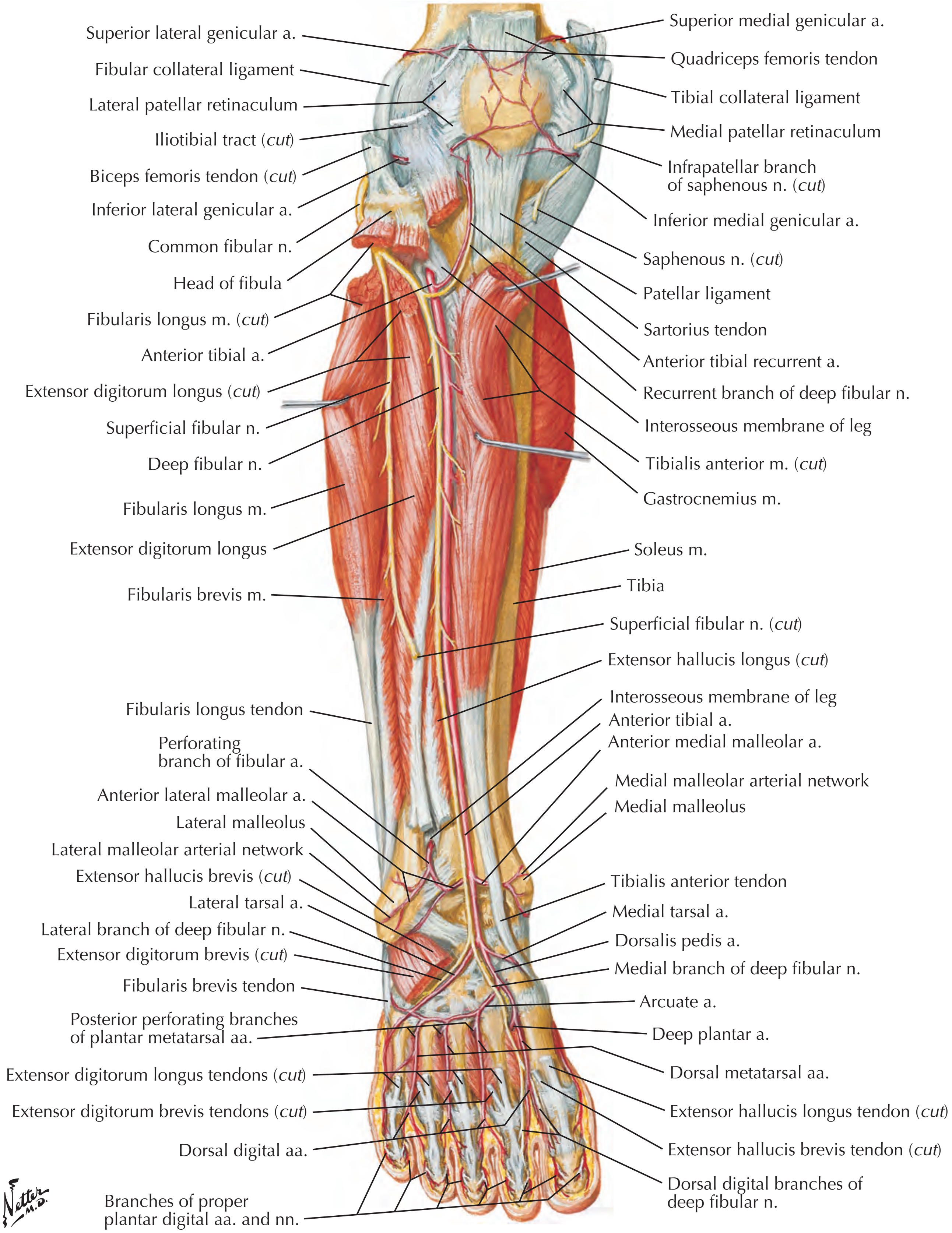

Vastus lateralis m.
Biceps femoris m.
Long head
Short head
Tendon
Iliotibial tract
Quadriceps femoris tendon
Superior lateral genicular a.
Patella
Fibular collateral ligament
Lateral patellar retinaculum
Common fibular
Lateral condyle of tibia
Patellar ligament
Inferior lateral genicular a.
Tibial tuberosity
Head of fibula
Tibialis anterior m.
Lateral head of gastrocnemius m.
Extensor digitorum longus
Soleus m.
Fibularis longus m. and tendon
Superficial fibular n. (*cut*)
Extensor digitorum longus tendon
Fibularis brevis m. and tendon
Extensor hallucis longus and tendon
Superior extensor retinaculum
Fibula
Inferior extensor retinaculum
Extensor digitorum brevis
Lateral malleolus
Extensor hallucis longus tendon
Calcaneal tendon (Achilles')
Extensor digitorum longus tendons
Subtendinous bursa of calcaneal tendon
Fibularis brevis tendon
Fibularis tertius tendon
Superior fibular retinaculum
5th metatarsal bone
Inferior fibular retinaculum
Fibularis longus tendon

See also **Plates 554, BP 106**


Vastus lateralis m.
Rectus femoris tendon
Iliotibial tract
Quadriceps femoris tendon
Superior lateral genicular a.
Lateral patellar retinaculum
Biceps femoris tendon
Inferior lateral genicular a.
Common fibular n.
Head of fibula
Fibularis longus m.
Tibialis anterior m.
Superficial fibular n. (*cut*)
Fibularis brevis m.
Extensor digitorum longus
Fibula
Superior extensor retinaculum
Lateral malleolus
Inferior extensor retinaculum
Extensor digitorum longus tendons
Fibularis tertius tendon
Extensor digitorum brevis tendons
Dorsal digital branches of superficial fibular n.
Vastus medialis m.
Patella
Superior medial genicular a.
Tibial collateral ligament
Medial patellar retinaculum
Inferior medial genicular a.
Infrapatellar branch of saphenous n. (*cut*)
Saphenous n. (*cut*)
Knee joint capsule
Patellar ligament
Sartorius tendon
Tibial tuberosity
Tibia
Medial head of gastrocnemius m.
Soleus m.
Extensor hallucis longus
Medial malleolus
Tibialis anterior tendon
Medial branch of deep fibular n.
Extensor hallucis longus tendon
Extensor hallucis brevis
Dorsal digital branches of deep fibular n.
F. Netter M.D.

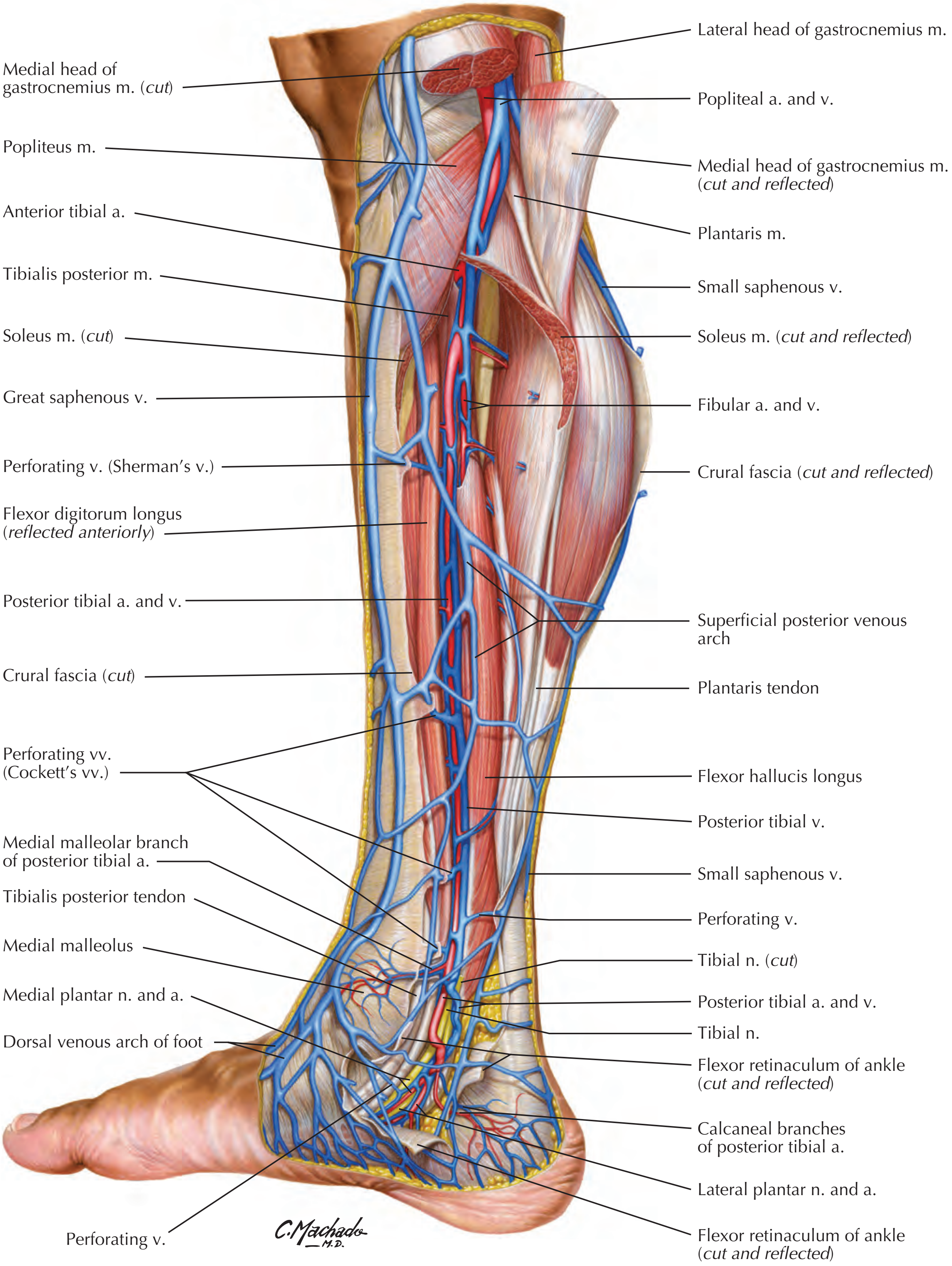
Muscles of Leg: Anterior Compartment (Continued)

See also **Plates 541, 554, BP 105, BP 106**



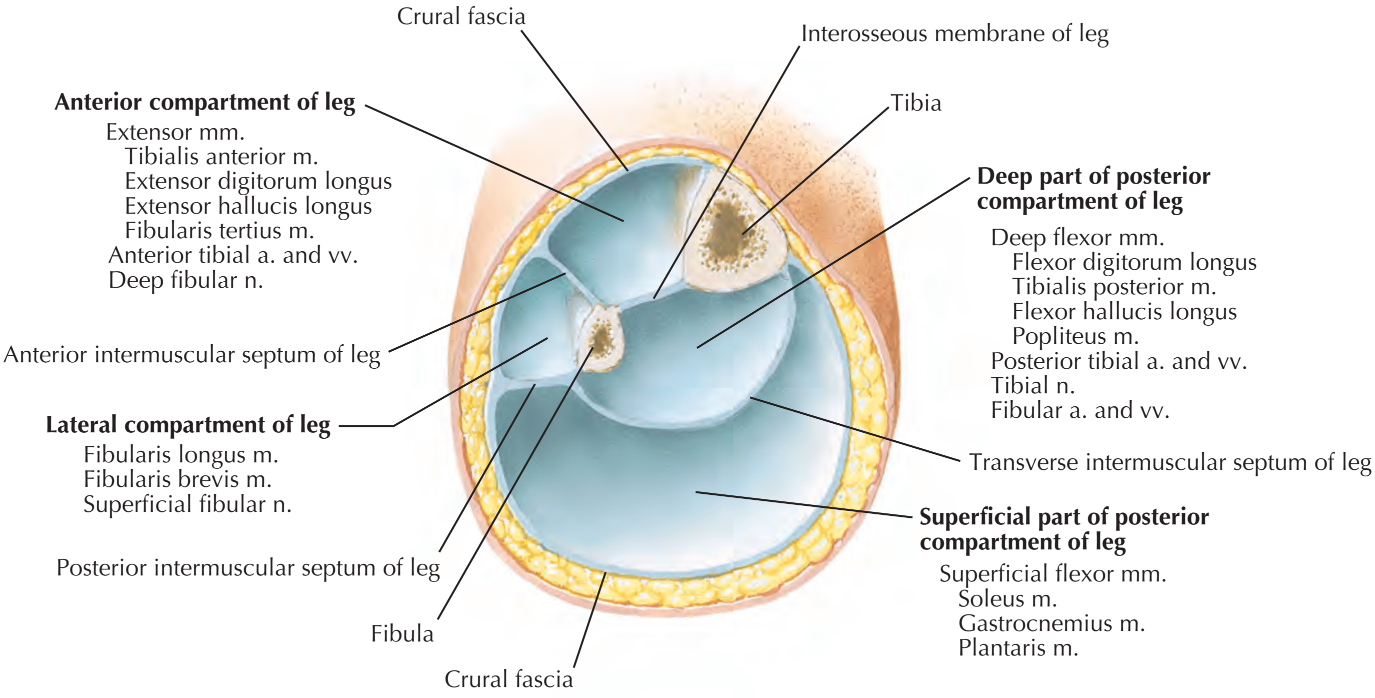
Superior lateral genicular a.
Fibular collateral ligament
Lateral patellar retinaculum
Iliotibial tract (*cut*)
Biceps femoris tendon (*cut*)
Inferior lateral genicular a.
Common fibular n.
Head of fibula
Fibularis longus m. (*cut*)
Anterior tibial a.
Extensor digitorum longus (*cut*)
Superficial fibular n.
Deep fibular n.
Fibularis longus m.
Extensor digitorum longus
Fibularis brevis m.
Fibularis longus tendon
Perforating branch of fibular a.
Anterior lateral malleolar a.
Lateral malleolus
Lateral malleolar arterial network
Extensor hallucis brevis (*cut*)
Lateral tarsal a.
Lateral branch of deep fibular n.
Extensor digitorum brevis (*cut*)
Fibularis brevis tendon
Posterior perforating branches of plantar metatarsal aa.
Extensor digitorum longus tendons (*cut*)
Extensor digitorum brevis tendons (*cut*)
Dorsal digital aa.
Branches of proper plantar digital aa. and nn.
Superior medial genicular a.
Quadriceps femoris tendon
Tibial collateral ligament
Medial patellar retinaculum
Infrapatellar branch of saphenous n. (*cut*)
Inferior medial genicular a.
Saphenous n. (*cut*)
Patellar ligament
Sartorius tendon
Anterior tibial recurrent a.
Recurrent branch of deep fibular n.
Interosseous membrane of leg
Tibialis anterior m. (*cut*)
Gastrocnemius m.
Soleus m.
Tibia
Superficial fibular n. (*cut*)
Extensor hallucis longus (*cut*)
Interosseous membrane of leg
Anterior tibial a.
Anterior medial malleolar a.
Medial malleolar arterial network
Medial malleolus
Tibialis anterior tendon
Medial tarsal a.
Dorsalis pedis a.
Medial branch of deep fibular n.
Arcuate a.
Deep plantar a.
Dorsal metatarsal aa.
Extensor hallucis longus tendon (*cut*)
Extensor hallucis brevis tendon (*cut*)
Dorsal digital branches of deep fibular n.
F. Netter M.D.

See also **Plates 492, 493, 523**

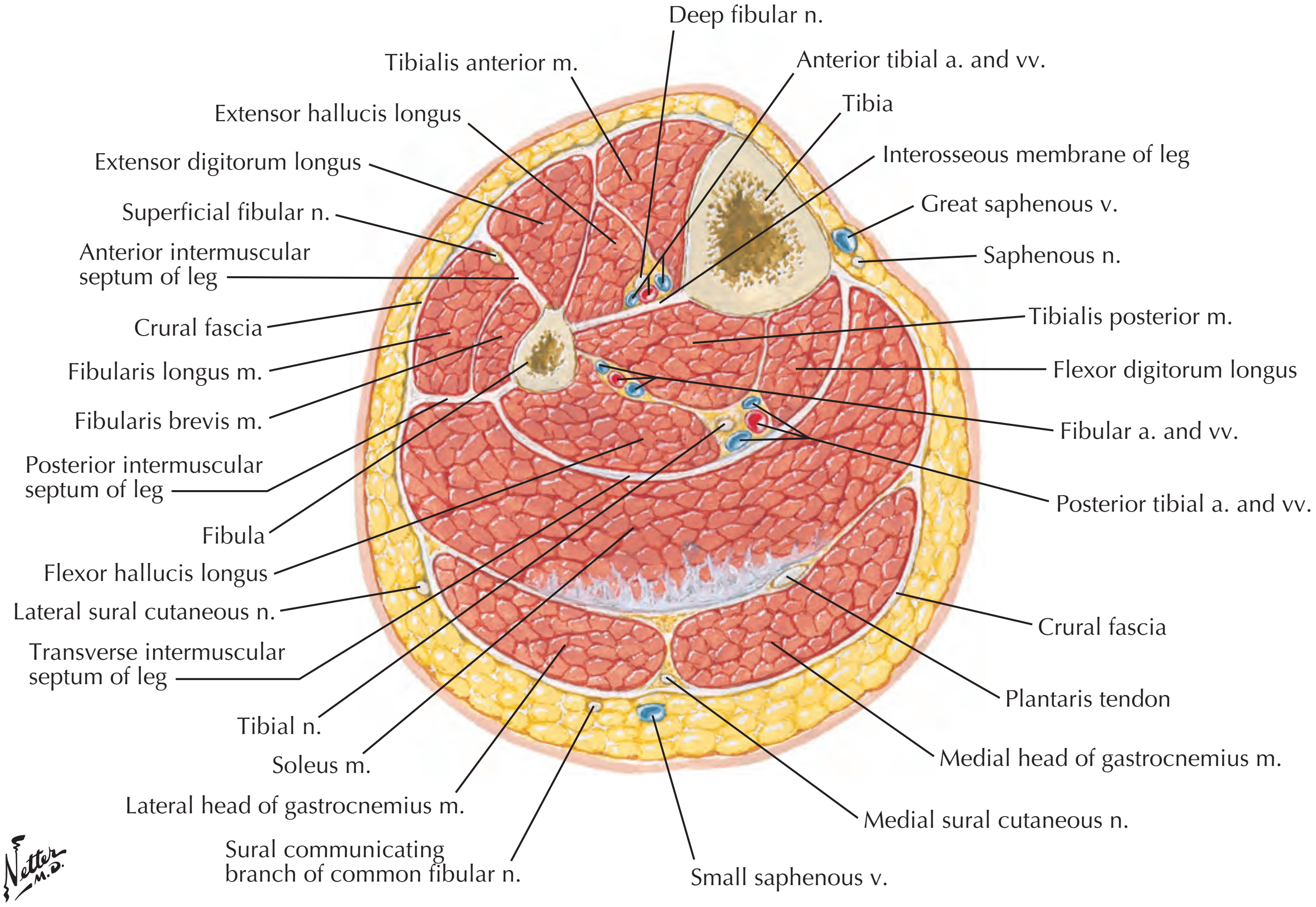

Medial head of gastrocnemius m. (*cut*)
Popliteus m.
Anterior tibial a.
Tibialis posterior m.
Soleus m. (*cut*)
Great saphenous v.
Perforating v. (Sherman's v.)
Flexor digitorum longus (*reflected anteriorly*)
Posterior tibial a. and v.
Crural fascia (*cut*)
Perforating vv. (Cockett's vv.)
Medial malleolar branch of posterior tibial a.
Tibialis posterior tendon
Medial malleolus
Medial plantar n. and a.
Dorsal venous arch of foot
Perforating v.
Lateral head of gastrocnemius m.
Popliteal a. and v.
Medial head of gastrocnemius m. (*cut and reflected*)
Plantaris m.
Small saphenous v.
Soleus m. (*cut and reflected*)
Fibular a. and v.
Crural fascia (*cut and reflected*)
Superficial posterior venous arch
Plantaris tendon
Flexor hallucis longus
Posterior tibial v.
Small saphenous v.
Perforating v.
Tibial n. (*cut*)
Posterior tibial a. and v.
Tibial n.
Flexor retinaculum of ankle (*cut and reflected*)
Calcaneal branches of posterior tibial a.
Lateral plantar n. and a.
Flexor retinaculum of ankle (*cut and reflected*)
C. Machado M.D.

Leg: Cross Sections and Compartments

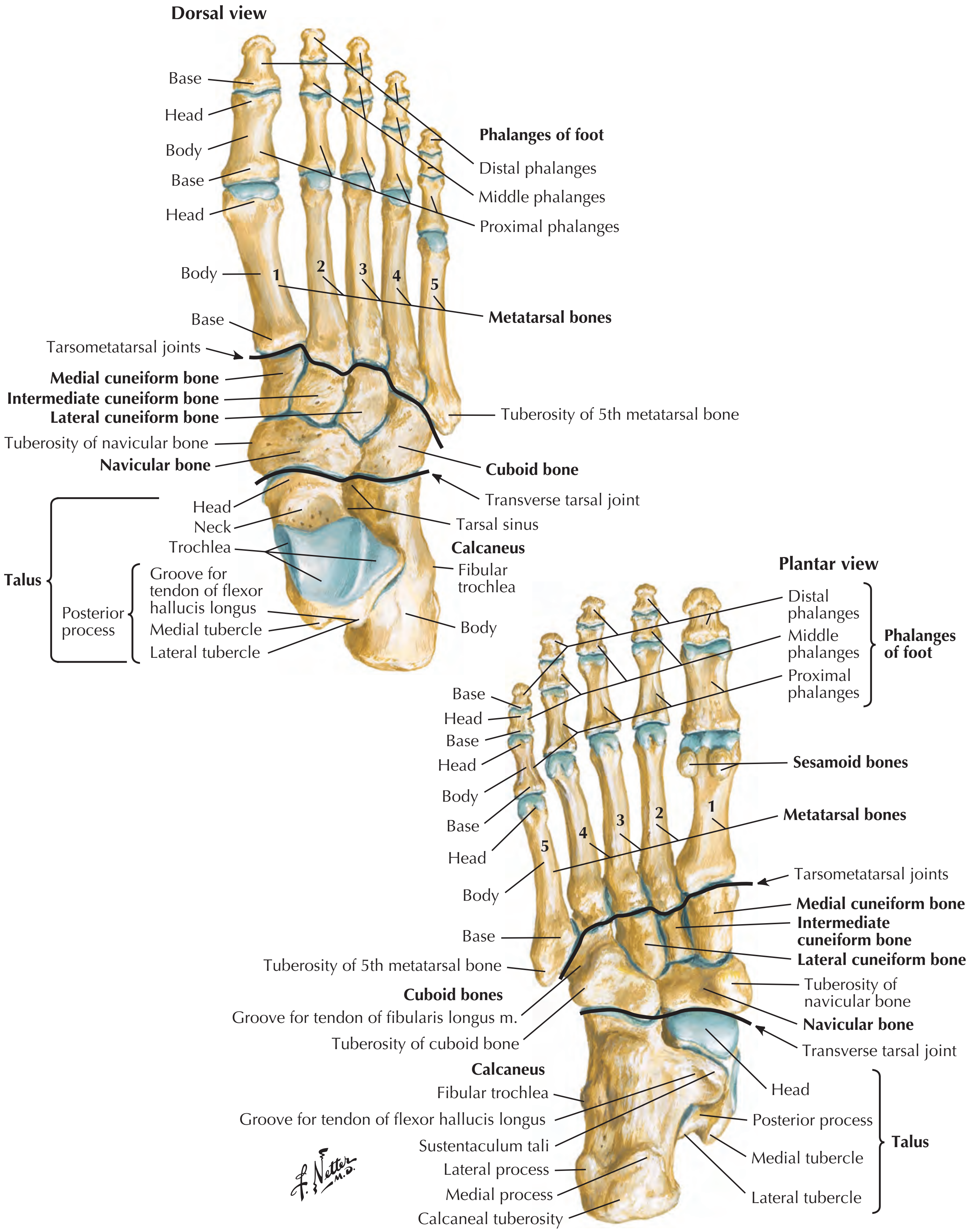
See also **Plate BP 106**


Crural fascia
Interosseous membrane of leg
Anterior compartment of leg
Extensor mm.
Tibialis anterior m.
Extensor digitorum longus
Extensor hallucis longus
Fibularis tertius m.
Anterior tibial a. and vv.
Deep fibular n.
Tibia
Deep part of posterior compartment of leg
Deep flexor mm.
Flexor digitorum longus
Tibialis posterior m.
Flexor hallucis longus
Popliteus m.
Posterior tibial a. and vv.
Tibial n.
Fibular a. and vv.
Anterior intermuscular septum of leg
Lateral compartment of leg
Fibularis longus m.
Fibularis brevis m.
Superficial fibular n.
Transverse intermuscular septum of leg
Superficial part of posterior compartment of leg
Superficial flexor mm.
Soleus m.
Gastrocnemius m.
Plantaris m.
Posterior intermuscular septum of leg
Fibula
Crural fascia

Cross section just above middle of leg


Deep fibular n.
Tibialis anterior m.
Anterior tibial a. and vv.
Extensor hallucis longus
Tibia
Extensor digitorum longus
Interosseous membrane of leg
Superficial fibular n.
Great saphenous v.
Anterior intermuscular septum of leg
Saphenous n.
Crural fascia
Tibialis posterior m.
Fibularis longus m.
Flexor digitorum longus
Fibularis brevis m.
Fibular a. and vv.
Posterior intermuscular septum of leg
Posterior tibial a. and vv.
Fibula
Flexor hallucis longus
Lateral sural cutaneous n.
Crural fascia
Transverse intermuscular septum of leg
Plantaris tendon
Tibial n.
Soleus m.
Medial head of gastrocnemius m.
Lateral head of gastrocnemius m.
Medial sural cutaneous n.
Sural communicating branch of common fibular n.
Small saphenous v.

Bones of Foot: Superior and Inferior Views

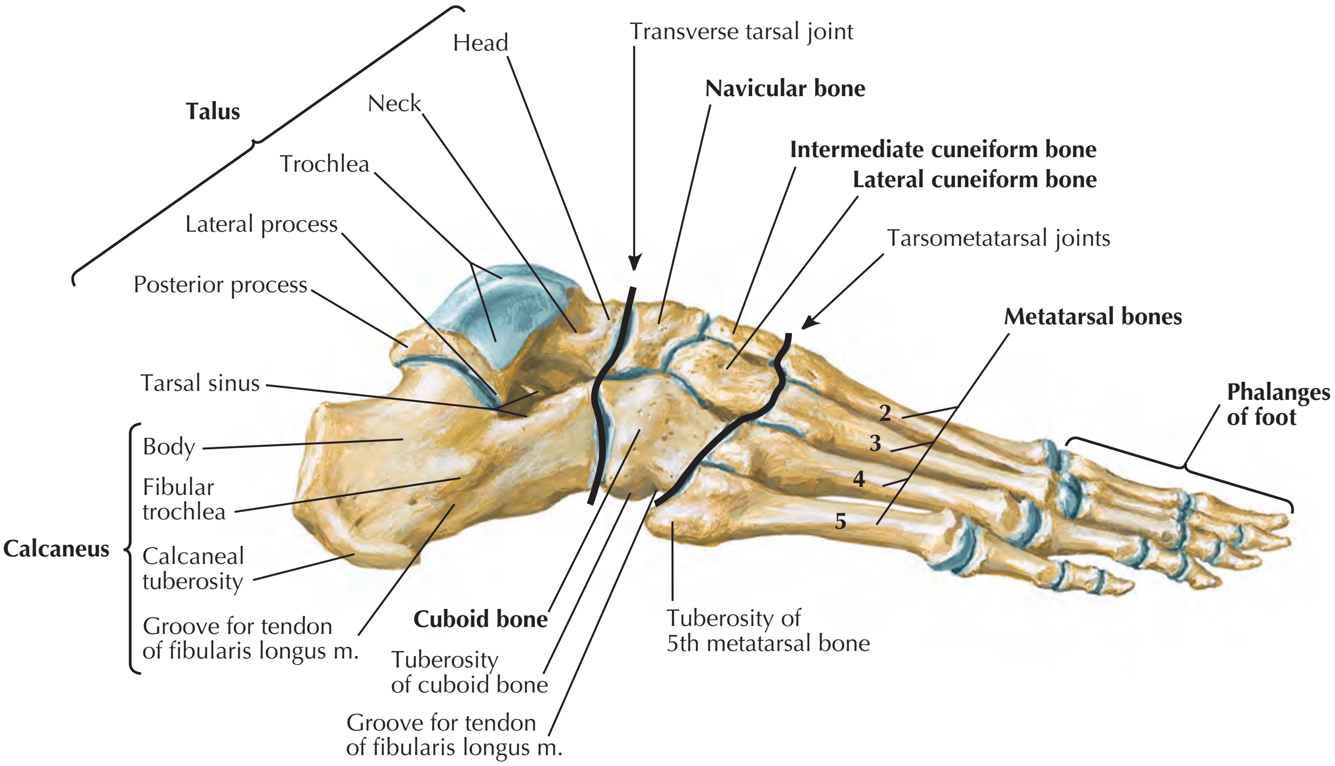

Dorsal view

Base
Head
Body
Base
Head
Body
Base
Tarsometatarsal joints
Medial cuneiform bone
Intermediate cuneiform bone
Lateral cuneiform bone
Tuberosity of navicular bone
Navicular bone
Talus
Head
Neck
Trochlea
Posterior process
Groove for tendon of flexor hallucis longus
Medial tubercle
Lateral tubercle
Phalanges of foot
Distal phalanges
Middle phalanges
Proximal phalanges
1
2
3
4
5
Metatarsal bones
Tuberosity of 5th metatarsal bone
Cuboid bone
Transverse tarsal joint
Tarsal sinus
Calcaneus
Fibular trochlea
Body

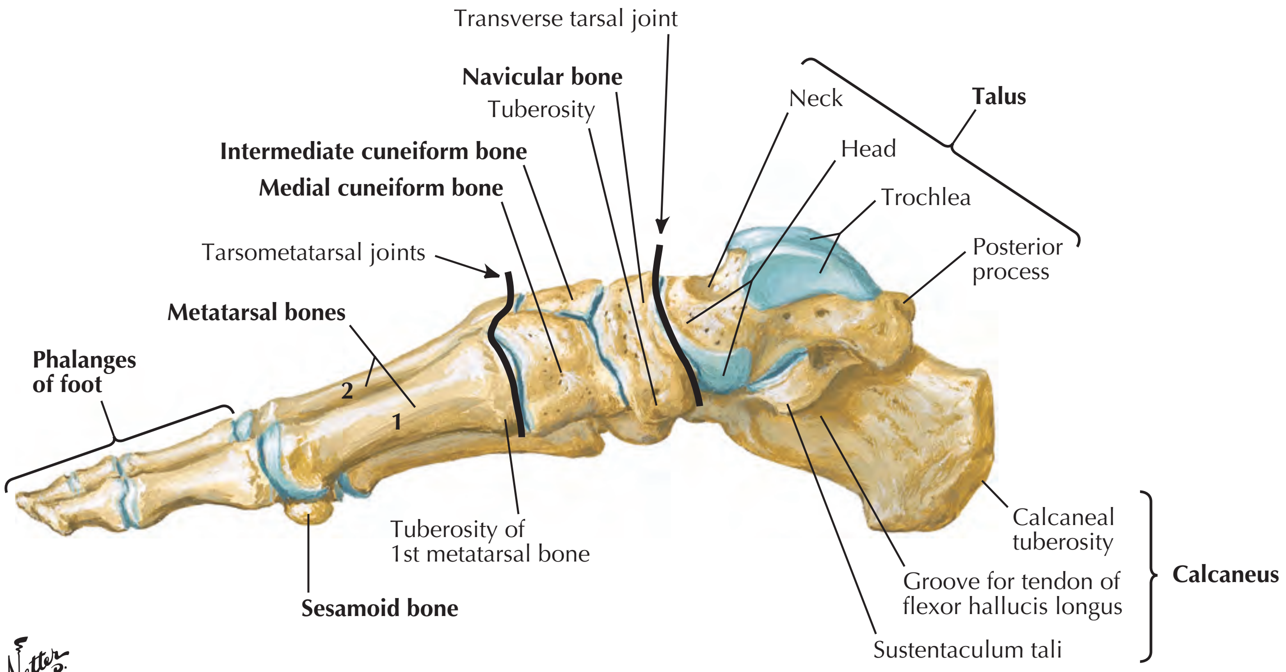
Plantar view

Distal phalanges
Middle phalanges
Proximal phalanges
Phalanges of foot
Sesamoid bones
Metatarsal bones
1
2
3
4
5
Tarsometatarsal joints
Medial cuneiform bone
Intermediate cuneiform bone
Lateral cuneiform bone
Tuberosity of navicular bone
Navicular bone
Transverse tarsal joint
Talus
Head
Posterior process
Medial tubercle
Lateral tubercle
Base
Head
Base
Head
Body
Base
Head
Body
Base
Tuberosity of 5th metatarsal bone
Cuboid bones
Groove for tendon of fibularis longus m.
Tuberosity of cuboid bone
Calcaneus
Fibular trochlea
Groove for tendon of flexor hallucis longus
Sustentaculum tali
Lateral process
Medial process
Calcaneal tuberosity

Lateral view

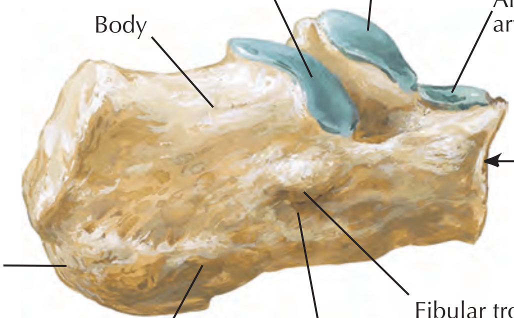

Head
Transverse tarsal joint
Talus
Neck
Navicular bone
Trochlea
Intermediate cuneiform bone
Lateral cuneiform bone
Lateral process
Tarsometatarsal joints
Posterior process
Metatarsal bones
Phalanges of foot
Tarsal sinus
2
3
4
5
Body
Fibular trochlea
Calcaneus
Calcaneal tuberosity
Groove for tendon of fibularis longus m.
Cuboid bone
Tuberosity of cuboid bone
Groove for tendon of fibularis longus m.
Tuberosity of 5th metatarsal bone

Medial view

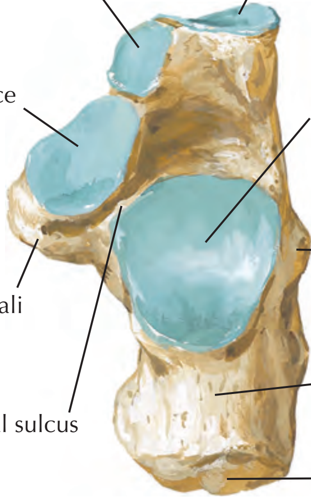

Transverse tarsal joint
Navicular bone
Tuberosity
Neck
Talus
Intermediate cuneiform bone
Head
Medial cuneiform bone
Trochlea
Tarsometatarsal joints
Posterior process
Metatarsal bones
Phalanges of foot
2
1
Tuberosity of 1st metatarsal bone
Calcaneal tuberosity
Groove for tendon of flexor hallucis longus
Calcaneus
Sesamoid bone
Sustentaculum tali

See also **Plate 556**

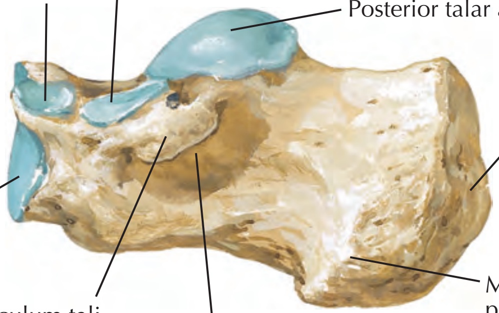
Right foot


Posterior talar articular surface
Middle talar articular surface
Body
Anterior talar articular surface
Articular surface for cuboid bone
Calcaneal tuberosity
Fibular trochlea
Lateral process of calcaneal tuberosity
Groove for tendon of fibularis longus m.

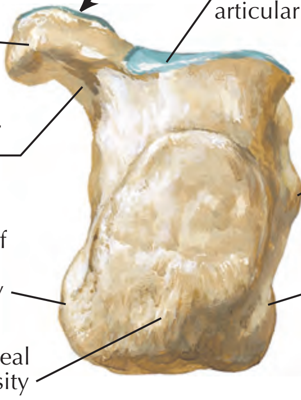
Lateral view


Anterior talar articular surface
Articular surface for cuboid bone
Middle talar articular surface
Posterior talar articular surface
Fibular trochlea
Sustentaculum tali
Body
Calcaneal sulcus
Calcaneal tuberosity

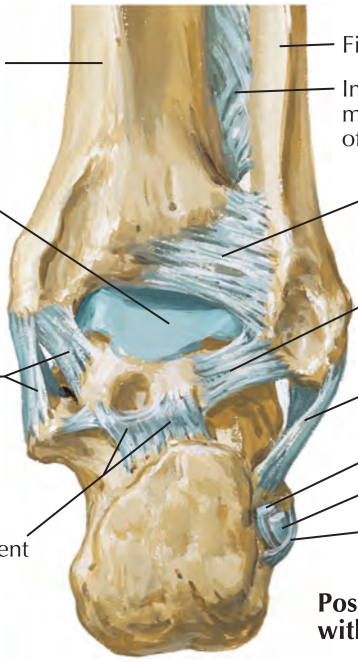
Superior view


Anterior talar articular surface
Middle talar articular surface
Posterior talar articular surface
Calcaneal tuberosity
Articular surface for cuboid bone
Sustentaculum tali
Groove for tendon of flexor hallucis longus
Medial process of calcaneal tuberosity

Medial view


Middle talar articular surface
Posterior talar articular surface
Sustentaculum tali
Groove for tendon of flexor hallucis longus
Fibular trochlea
Medial process of calcaneal tuberosity
Lateral process of calcaneal tuberosity
Calcaneal tuberosity

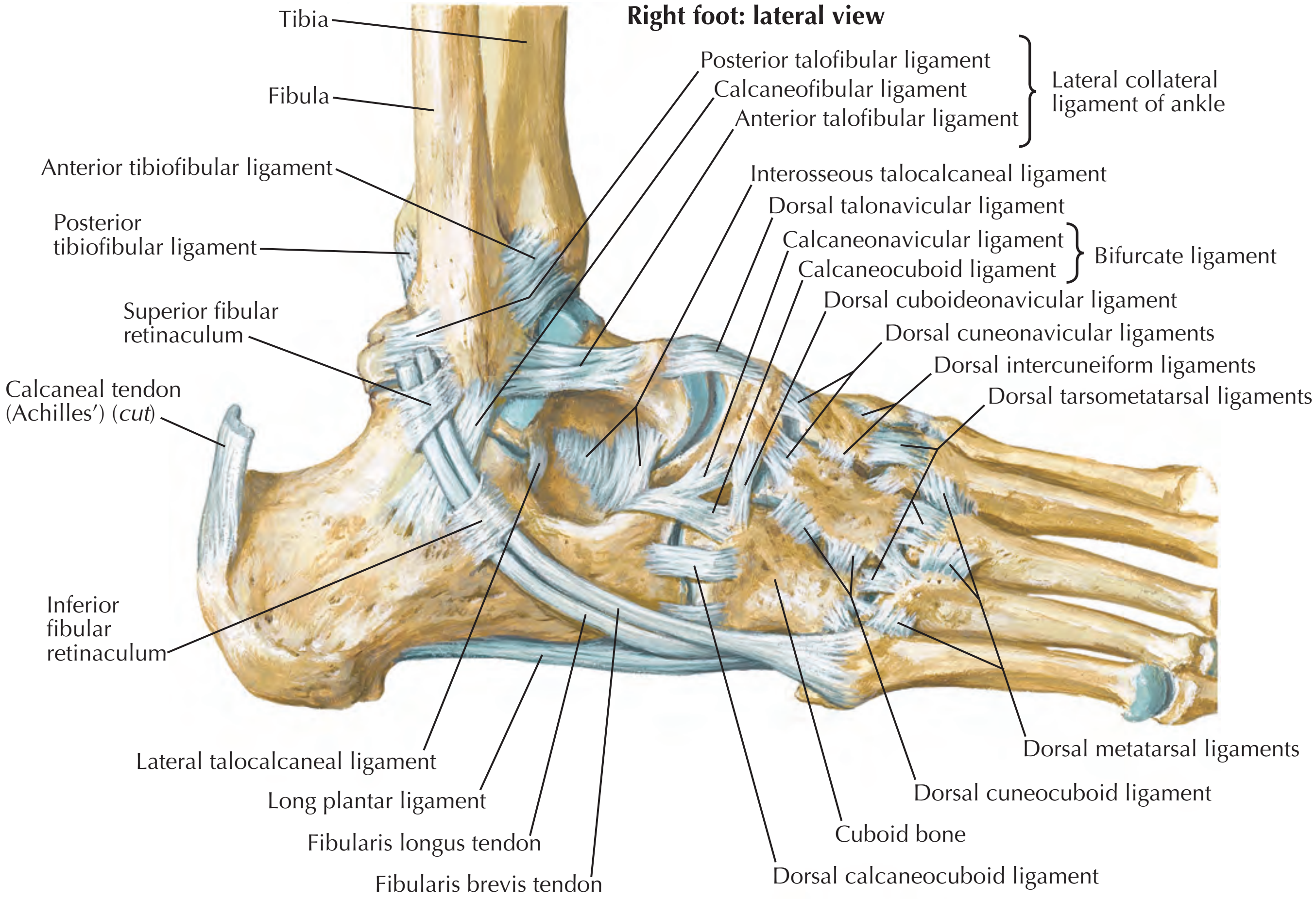
Posterior view


Tibia
Fibula
Interosseous membrane of leg
Trochlea of talus
Posterior tibiofibular ligament
Posterior talofibular ligament
Medial collateral ligament of ankle (deltoid ligament)
Calcaneofibular ligament
Fibularis longus tendon
Fibularis brevis tendon
Posterior talocalcaneal ligament
Inferior fibular retinaculum

Posterior view with ligaments

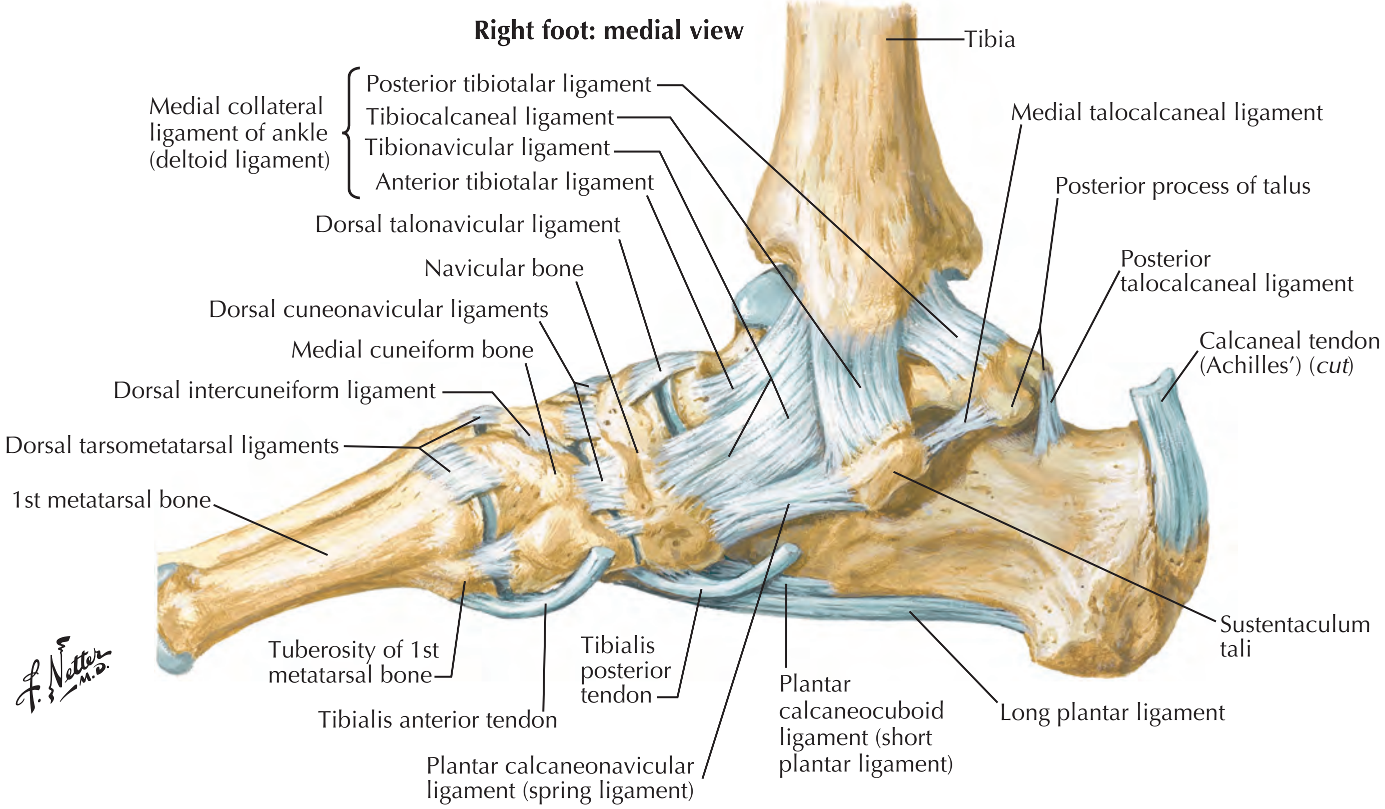
Ligaments of Ankle and Foot

See also **Plate 556**



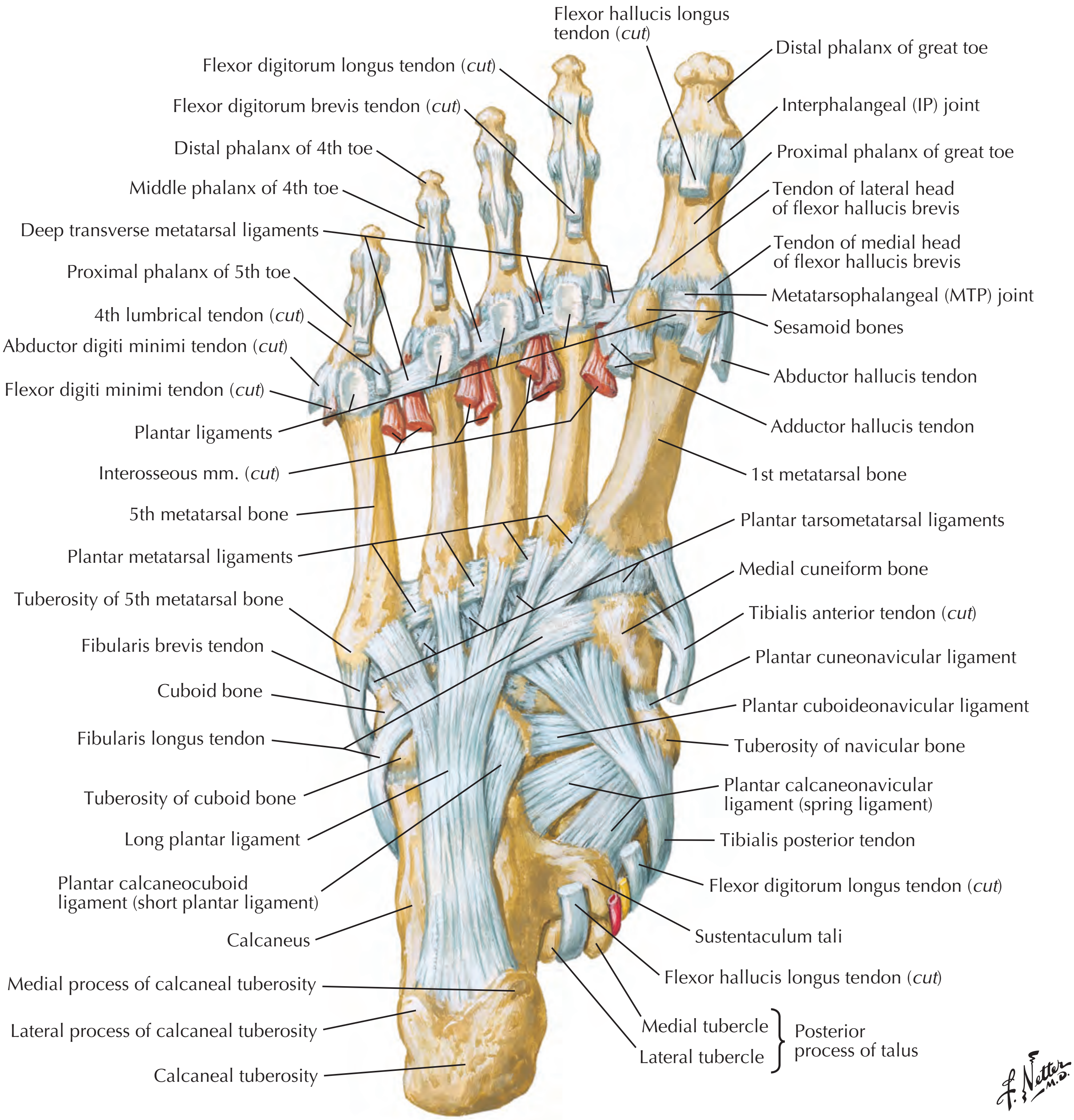
Right foot: lateral view

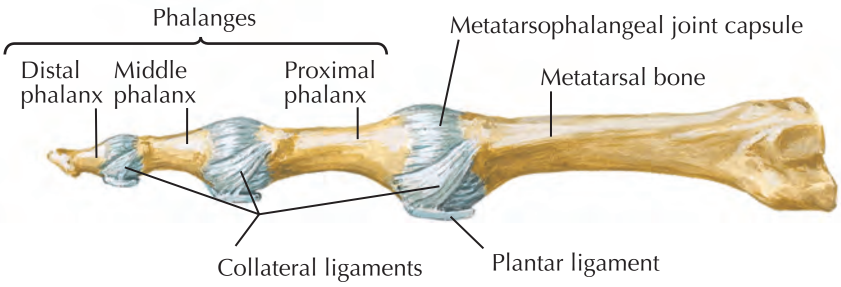
Tibia
Fibula
Anterior tibiofibular ligament
Posterior tibiofibular ligament
Superior fibular retinaculum
Calcaneal tendon (Achilles') (*cut*)
Inferior fibular retinaculum
Posterior talofibular ligament
Calcaneofibular ligament
Anterior talofibular ligament
Lateral collateral ligament of ankle
Interosseous talocalcaneal ligament
Dorsal talonavicular ligament
Calcaneonavicular ligament
Calcaneocuboid ligament
Bifurcate ligament
Dorsal cuboideonavicular ligament
Dorsal cuneonavicular ligaments
Dorsal intercuneiform ligaments
Dorsal tarsometatarsal ligaments
Lateral talocalcaneal ligament
Long plantar ligament
Fibularis longus tendon
Fibularis brevis tendon
Dorsal metatarsal ligaments
Dorsal cuneocuboid ligament
Cuboid bone
Dorsal calcaneocuboid ligament



Right foot: medial view

Tibia
Medial collateral ligament of ankle (deltoid ligament)
Posterior tibiotalar ligament
Tibiocalcaneal ligament
Tibionavicular ligament
Anterior tibiotalar ligament
Dorsal talonavicular ligament
Navicular bone
Dorsal cuneonavicular ligaments
Medial cuneiform bone
Dorsal intercuneiform ligament
Dorsal tarsometatarsal ligaments
1st metatarsal bone
Medial talocalcaneal ligament
Posterior process of talus
Posterior talocalcaneal ligament
Calcaneal tendon (Achilles') (*cut*)
Sustentaculum tali
Tuberosity of 1st metatarsal bone
Tibialis anterior tendon
Tibialis posterior tendon
Plantar calcaneonavicular ligament (spring ligament)
Plantar calcaneocuboid ligament (short plantar ligament)
Long plantar ligament

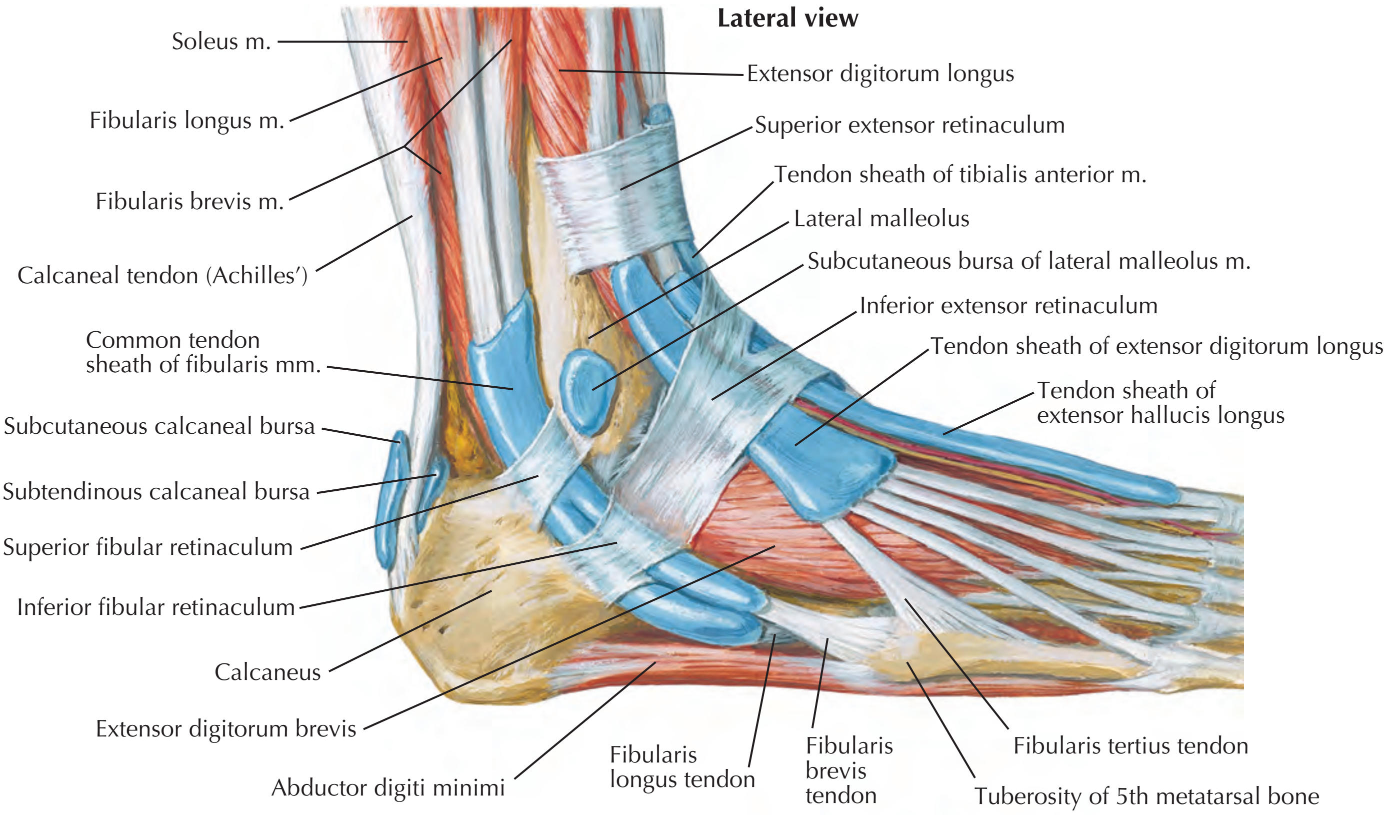

Flexor hallucis longus tendon (*cut*)
Distal phalanx of great toe
Flexor digitorum longus tendon (*cut*)
Interphalangeal (IP) joint
Flexor digitorum brevis tendon (*cut*)
Proximal phalanx of great toe
Distal phalanx of 4th toe
Tendon of lateral head of flexor hallucis brevis
Middle phalanx of 4th toe
Tendon of medial head of flexor hallucis brevis
Deep transverse metatarsal ligaments
Metatarsophalangeal (MTP) joint
Proximal phalanx of 5th toe
Sesamoid bones
4th lumbrical tendon (*cut*)
Abductor digiti minimi tendon (*cut*)
Abductor hallucis tendon
Flexor digiti minimi tendon (*cut*)
Adductor hallucis tendon
Plantar ligaments
1st metatarsal bone
Interosseous mm. (*cut*)
5th metatarsal bone
Plantar tarsometatarsal ligaments
Plantar metatarsal ligaments
Medial cuneiform bone
Tuberosity of 5th metatarsal bone
Tibialis anterior tendon (*cut*)
Fibularis brevis tendon
Plantar cuneonavicular ligament
Cuboid bone
Plantar cuboideonavicular ligament
Fibularis longus tendon
Tuberosity of navicular bone
Tuberosity of cuboid bone
Plantar calcaneonavicular ligament (spring ligament)
Long plantar ligament
Tibialis posterior tendon
Plantar calcaneocuboid ligament (short plantar ligament)
Flexor digitorum longus tendon (*cut*)
Calcaneus
Sustentaculum tali
Medial process of calcaneal tuberosity
Flexor hallucis longus tendon (*cut*)
Lateral process of calcaneal tuberosity
Medial tubercle
Lateral tubercle
Posterior process of talus
Calcaneal tuberosity
F. Netter M.D.


Phalanges
Distal phalanx
Middle phalanx
Proximal phalanx
Metatarsophalangeal joint capsule
Metatarsal bone
Collateral ligaments
Plantar ligament

Capsules and ligaments of metatarsophalangeal and interphalangeal joints: lateral view

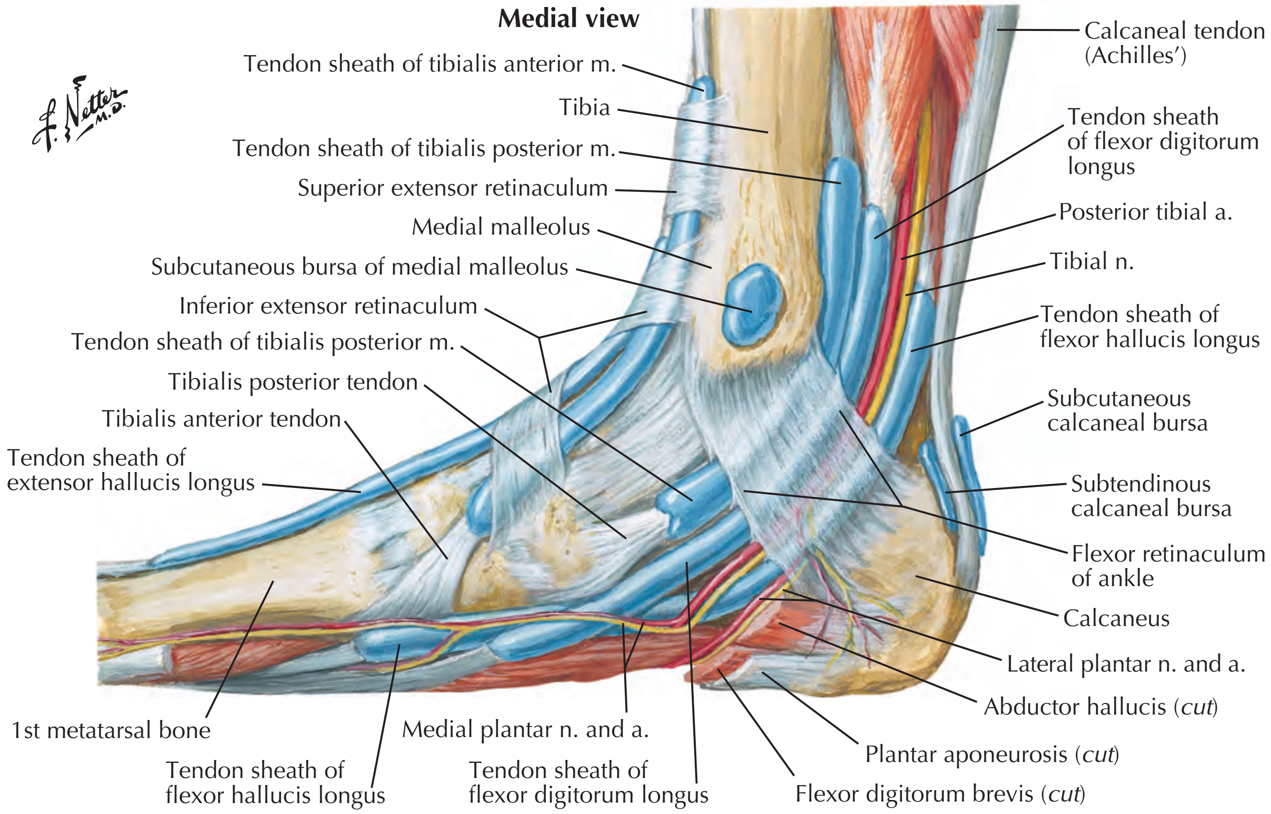
Tendon Sheaths of Ankle

See also **Plate 530**



Lateral view

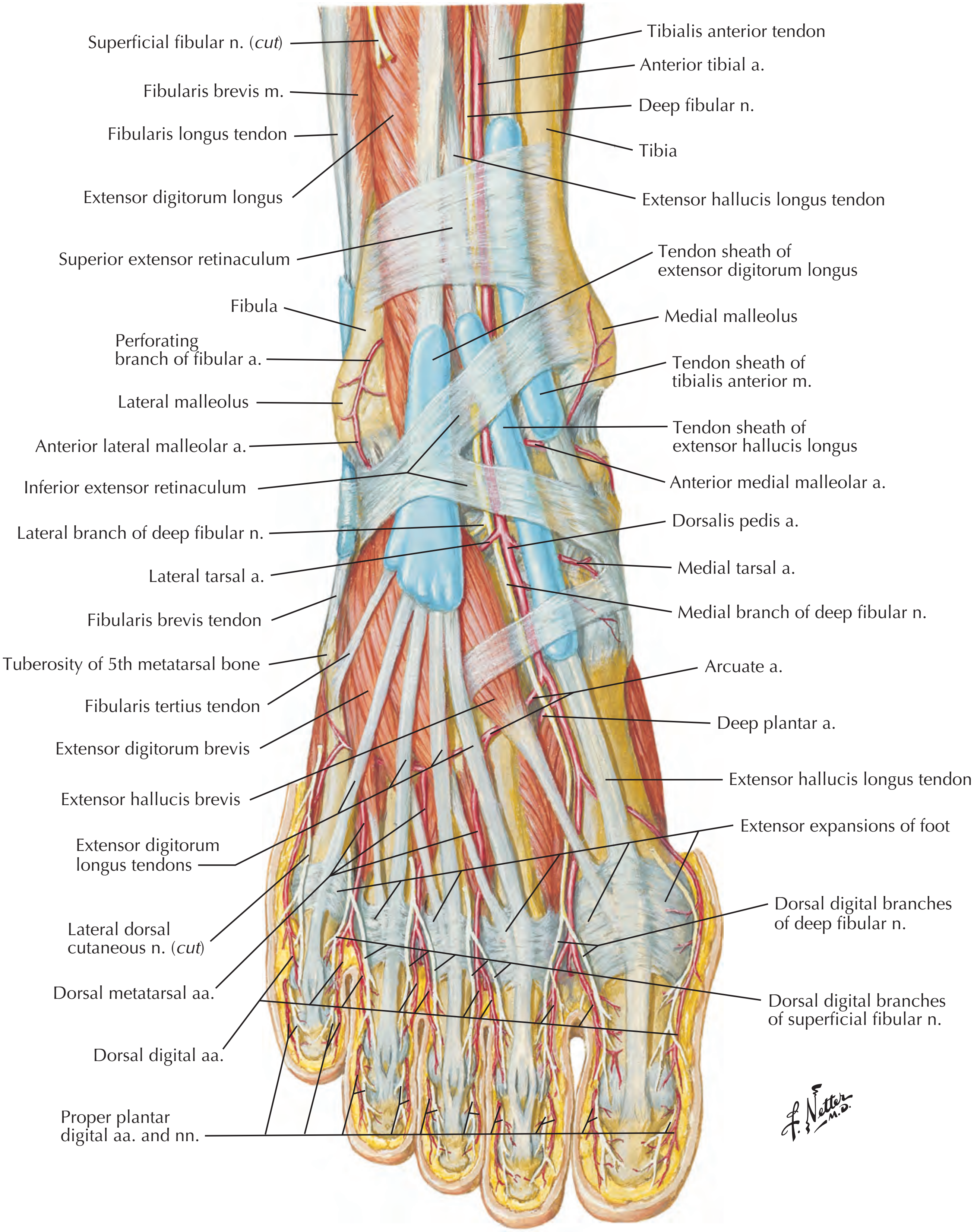
Soleus m.
Fibularis longus m.
Fibularis brevis m.
Calcaneal tendon (Achilles')
Common tendon sheath of fibularis mm.
Subcutaneous calcaneal bursa
Subtendinous calcaneal bursa
Superior fibular retinaculum
Inferior fibular retinaculum
Calcaneus
Extensor digitorum brevis
Abductor digiti minimi
Fibularis longus tendon
Fibularis brevis tendon
Tuberosity of 5th metatarsal bone
Fibularis tertius tendon
Extensor digitorum longus
Superior extensor retinaculum
Tendon sheath of tibialis anterior m.
Lateral malleolus
Subcutaneous bursa of lateral malleolus m.
Inferior extensor retinaculum
Tendon sheath of extensor digitorum longus
Tendon sheath of extensor hallucis longus



Medial view

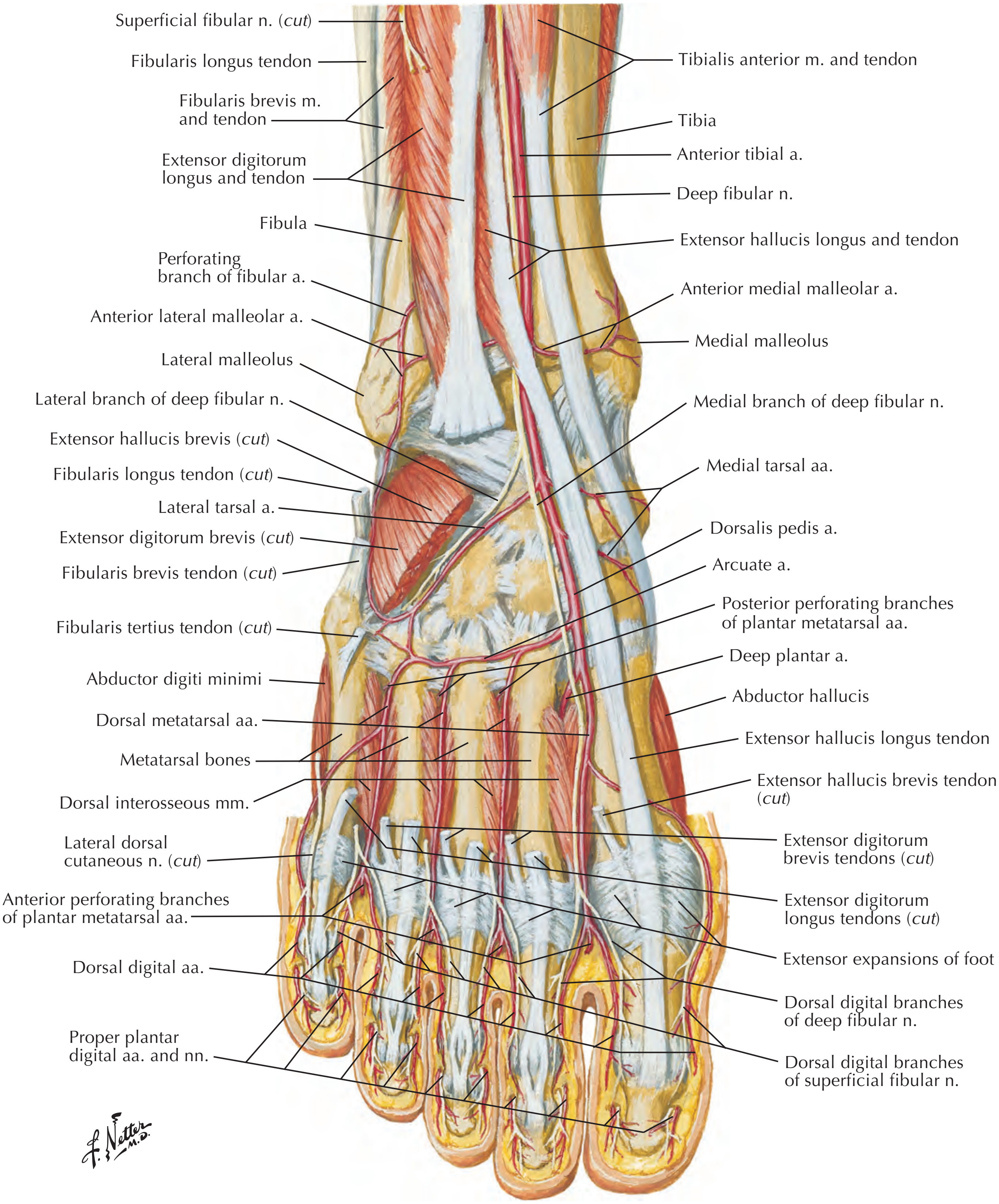
Tendon sheath of tibialis anterior m.
Tibia
Tendon sheath of tibialis posterior m.
Superior extensor retinaculum
Medial malleolus
Subcutaneous bursa of medial malleolus
Inferior extensor retinaculum
Tendon sheath of tibialis posterior m.
Tibialis posterior tendon
Tibialis anterior tendon
Tendon sheath of extensor hallucis longus
1st metatarsal bone
Tendon sheath of flexor hallucis longus
Medial plantar n. and a.
Tendon sheath of flexor digitorum longus
Flexor digitorum brevis (cut)
Plantar aponeurosis (cut)
Abductor hallucis (cut)
Lateral plantar n. and a.
Calcaneus
Flexor retinaculum of ankle
Subtendinous calcaneal bursa
Subcutaneous calcaneal bursa
Tendon sheath of flexor hallucis longus
Tibial n.
Posterior tibial a.
Tendon sheath of flexor digitorum longus
Calcaneal tendon (Achilles')

See also **Plates 554, BP 109**

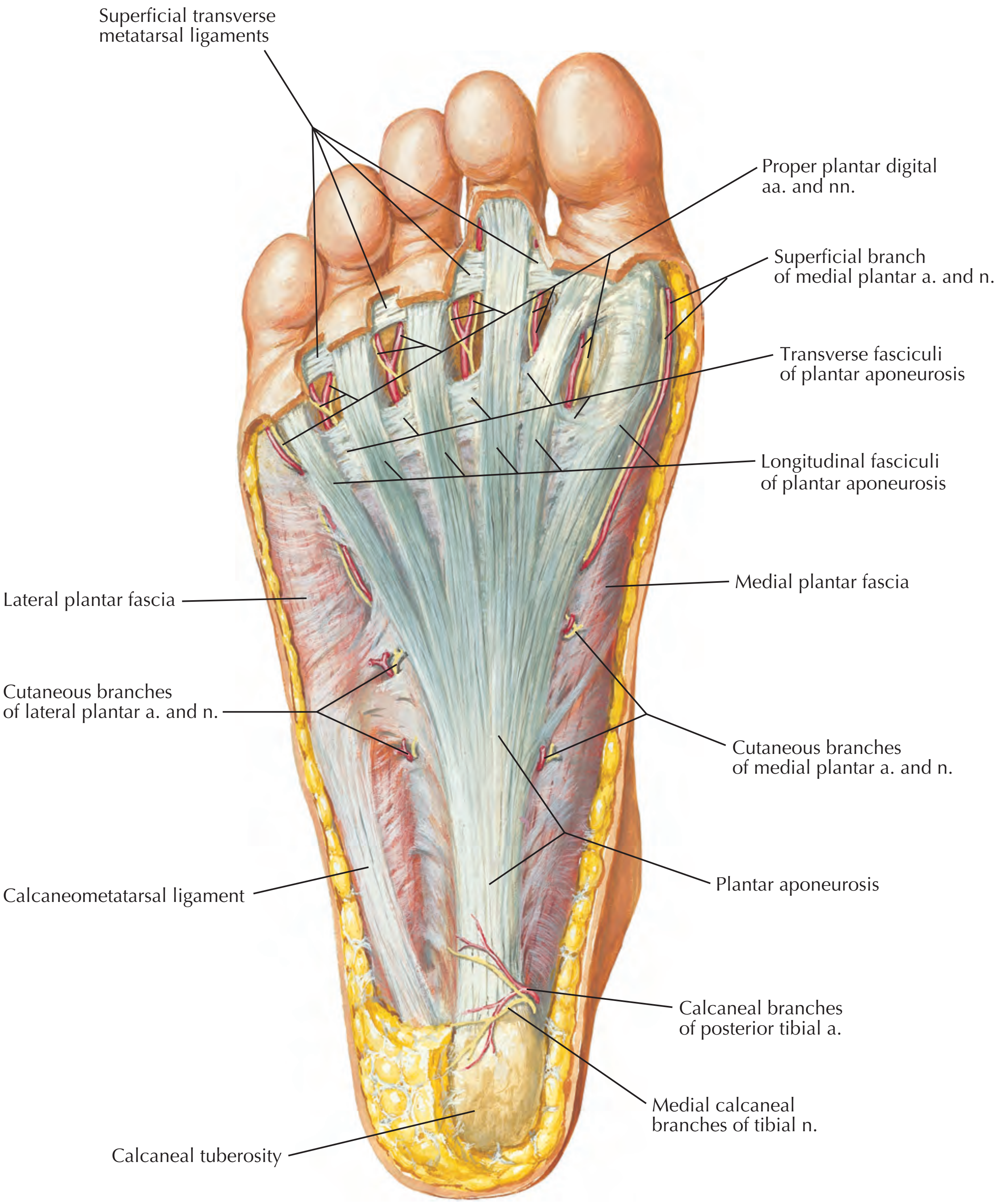

Superficial fibular n. (*cut*)
Fibularis brevis m.
Fibularis longus tendon
Extensor digitorum longus
Superior extensor retinaculum
Fibula
Perforating branch of fibular a.
Lateral malleolus
Anterior lateral malleolar a.
Inferior extensor retinaculum
Lateral branch of deep fibular n.
Lateral tarsal a.
Fibularis brevis tendon
Tuberosity of 5th metatarsal bone
Fibularis tertius tendon
Extensor digitorum brevis
Extensor hallucis brevis
Extensor digitorum longus tendons
Lateral dorsal cutaneous n. (*cut*)
Dorsal metatarsal aa.
Dorsal digital aa.
Proper plantar digital aa. and nn.
Tibialis anterior tendon
Anterior tibial a.
Deep fibular n.
Tibia
Extensor hallucis longus tendon
Tendon sheath of extensor digitorum longus
Medial malleolus
Tendon sheath of tibialis anterior m.
Tendon sheath of extensor hallucis longus
Anterior medial malleolar a.
Dorsalis pedis a.
Medial tarsal a.
Medial branch of deep fibular n.
Arcuate a.
Deep plantar a.
Extensor hallucis longus tendon
Extensor expansions of foot
Dorsal digital branches of deep fibular n.
Dorsal digital branches of superficial fibular n.
F. Netter M.D.

Muscles of Dorsum of Foot: Deep Dissection

See also **Plates 547, BP 109**

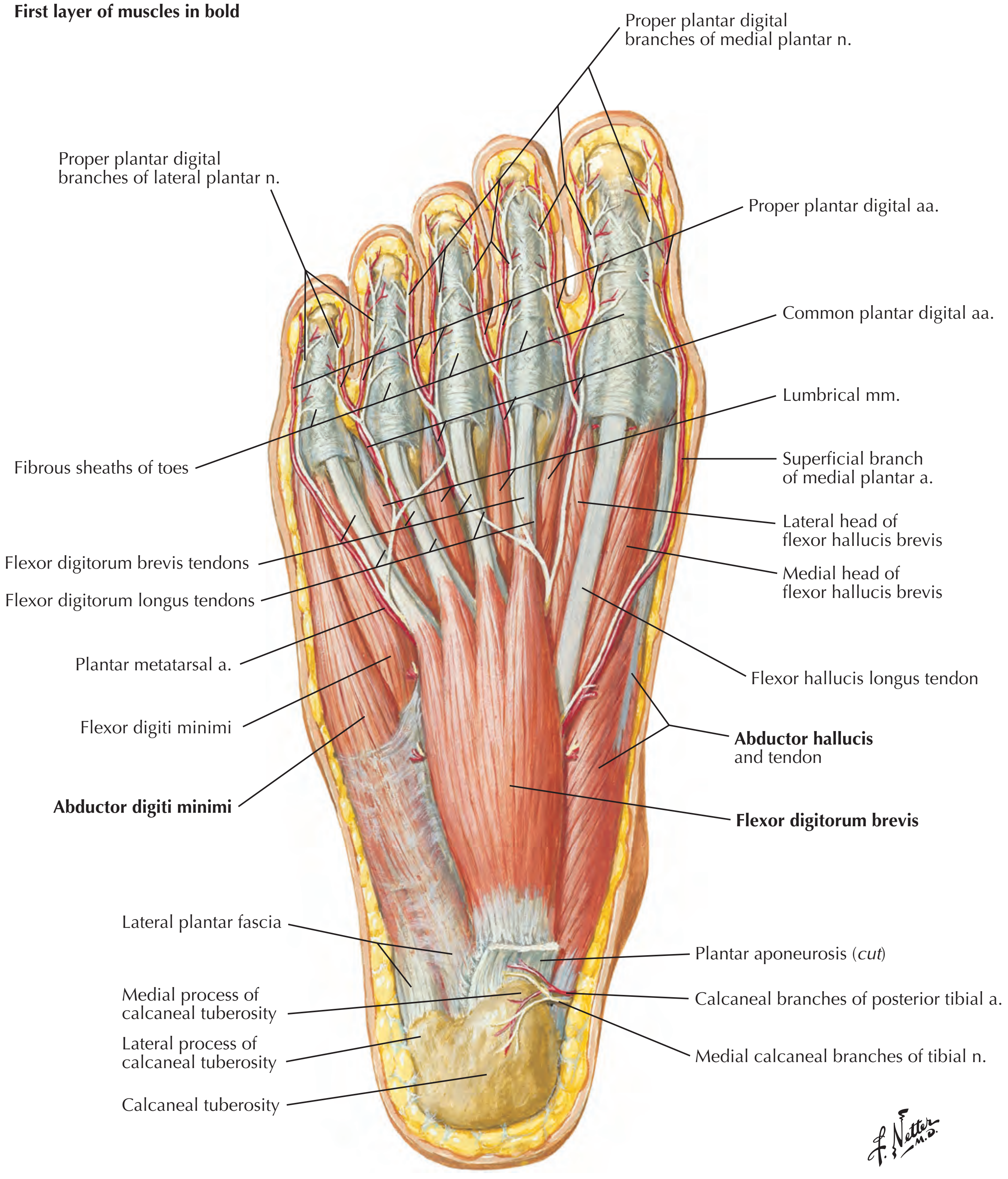


Superficial fibular n. (*cut*)
Fibularis longus tendon
Fibularis brevis m. and tendon
Extensor digitorum longus and tendon
Fibula
Perforating branch of fibular a.
Anterior lateral malleolar a.
Lateral malleolus
Lateral branch of deep fibular n.
Extensor hallucis brevis (*cut*)
Fibularis longus tendon (*cut*)
Lateral tarsal a.
Extensor digitorum brevis (*cut*)
Fibularis brevis tendon (*cut*)
Fibularis tertius tendon (*cut*)
Abductor digiti minimi
Dorsal metatarsal aa.
Metatarsal bones
Dorsal interosseous mm.
Lateral dorsal cutaneous n. (*cut*)
Anterior perforating branches of plantar metatarsal aa.
Dorsal digital aa.
Proper plantar digital aa. and nn.
Tibialis anterior m. and tendon
Tibia
Anterior tibial a.
Deep fibular n.
Extensor hallucis longus and tendon
Anterior medial malleolar a.
Medial malleolus
Medial branch of deep fibular n.
Medial tarsal aa.
Dorsalis pedis a.
Arcuate a.
Posterior perforating branches of plantar metatarsal aa.
Deep plantar a.
Abductor hallucis
Extensor hallucis longus tendon
Extensor hallucis brevis tendon (*cut*)
Extensor digitorum brevis tendons (*cut*)
Extensor digitorum longus tendons (*cut*)
Extensor expansions of foot
Dorsal digital branches of deep fibular n.
Dorsal digital branches of superficial fibular n.

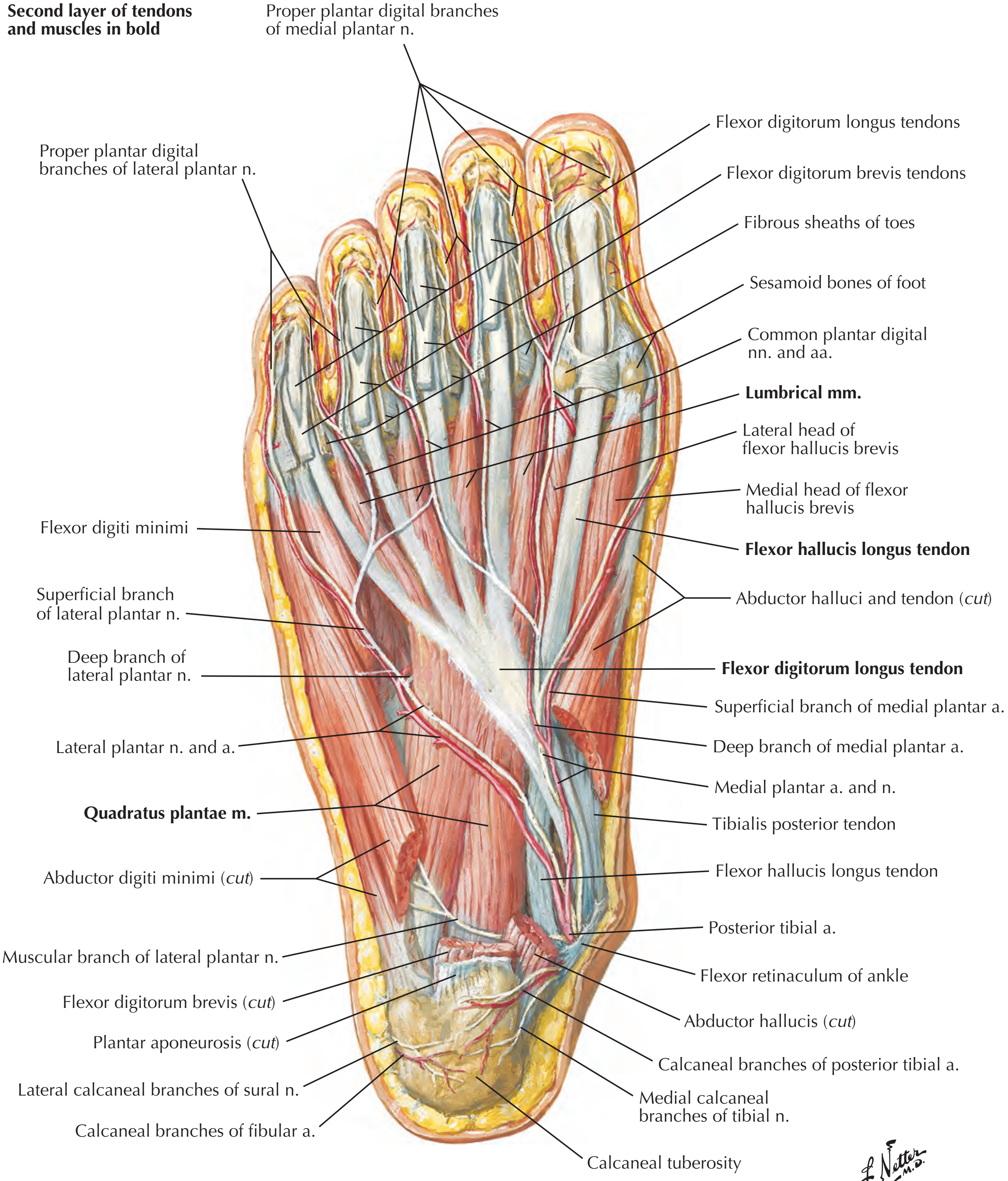

Superficial transverse metatarsal ligaments
Proper plantar digital aa. and nn.
Superficial branch of medial plantar a. and n.
Transverse fasciculi of plantar aponeurosis
Longitudinal fasciculi of plantar aponeurosis
Lateral plantar fascia
Medial plantar fascia
Cutaneous branches of lateral plantar a. and n.
Cutaneous branches of medial plantar a. and n.
Calcaneometatarsal ligament
Plantar aponeurosis
Calcaneal branches of posterior tibial a.
Medial calcaneal branches of tibial n.
Calcaneal tuberosity

F. Netter M.D.

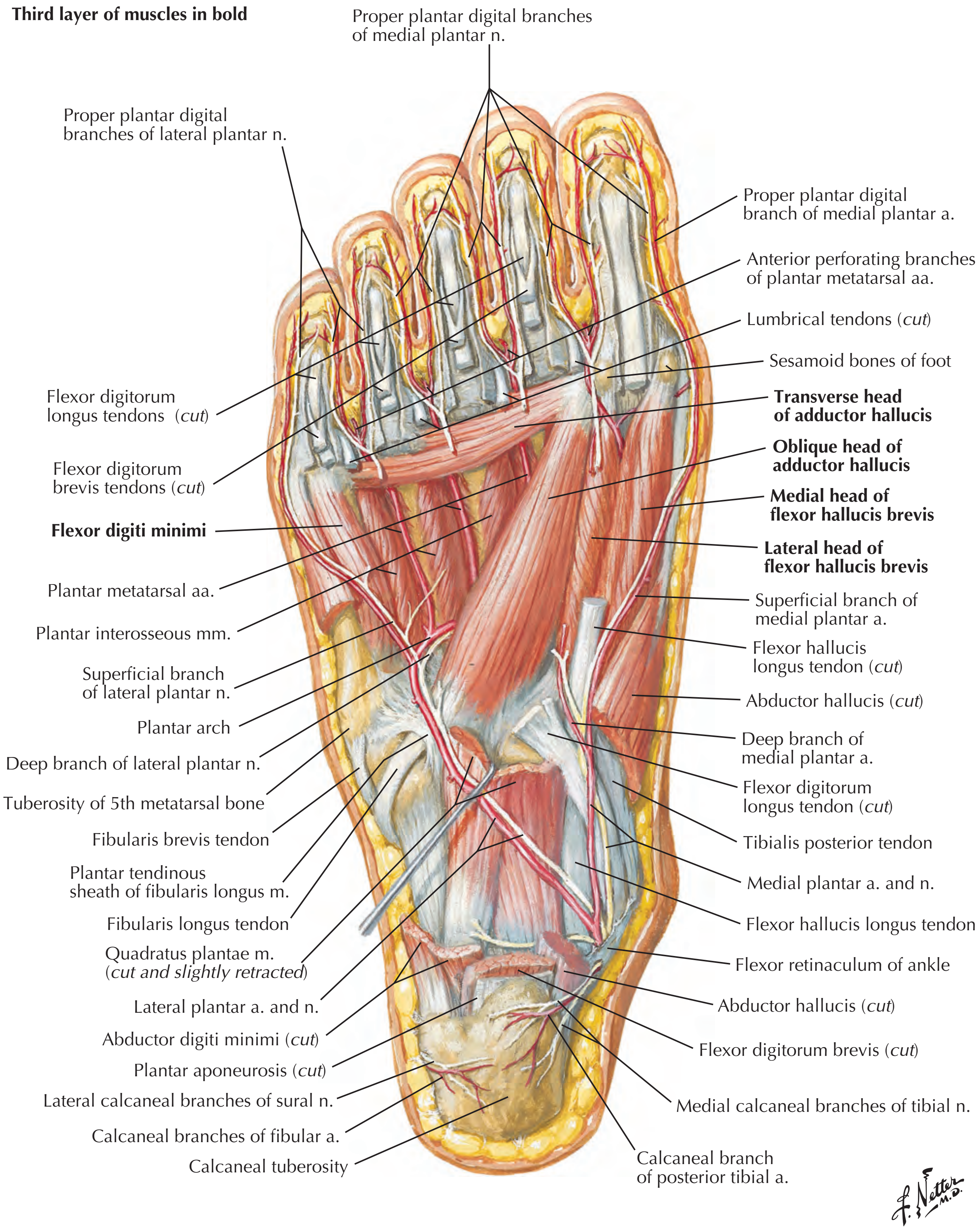
See also **Plates 553, BP 109**


First layer of muscles in bold
Proper plantar digital branches of medial plantar n.
Proper plantar digital branches of lateral plantar n.
Proper plantar digital aa.
Common plantar digital aa.
Lumbrical mm.
Fibrous sheaths of toes
Superficial branch of medial plantar a.
Lateral head of flexor hallucis brevis
Flexor digitorum brevis tendons
Medial head of flexor hallucis brevis
Flexor digitorum longus tendons
Plantar metatarsal a.
Flexor hallucis longus tendon
Flexor digiti minimi
Abductor hallucis and tendon
Abductor digiti minimi
Flexor digitorum brevis
Lateral plantar fascia
Plantar aponeurosis (*cut*)
Medial process of calcaneal tuberosity
Calcaneal branches of posterior tibial a.
Lateral process of calcaneal tuberosity
Medial calcaneal branches of tibial n.
Calcaneal tuberosity
F. Netter M.D.

See also **Plates 553, BP 109**


Second layer of tendons and muscles in bold
Proper plantar digital branches of medial plantar n.
Flexor digitorum longus tendons
Proper plantar digital branches of lateral plantar n.
Flexor digitorum brevis tendons
Fibrous sheaths of toes
Sesamoid bones of foot
Common plantar digital nn. and aa.
Lumbrical mm.
Lateral head of flexor hallucis brevis
Medial head of flexor hallucis brevis
Flexor digiti minimi
Flexor hallucis longus tendon
Abductor halluci and tendon (*cut*)
Superficial branch of lateral plantar n.
Deep branch of lateral plantar n.
Flexor digitorum longus tendon
Superficial branch of medial plantar a.
Lateral plantar n. and a.
Deep branch of medial plantar a.
Medial plantar a. and n.
Quadratus plantae m.
Tibialis posterior tendon
Abductor digiti minimi (*cut*)
Flexor hallucis longus tendon
Posterior tibial a.
Muscular branch of lateral plantar n.
Flexor retinaculum of ankle
Flexor digitorum brevis (*cut*)
Abductor hallucis (*cut*)
Plantar aponeurosis (*cut*)
Calcaneal branches of posterior tibial a.
Lateral calcaneal branches of sural n.
Medial calcaneal branches of tibial n.
Calcaneal branches of fibular a.
Calcaneal tuberosity
F. Netter M.D.

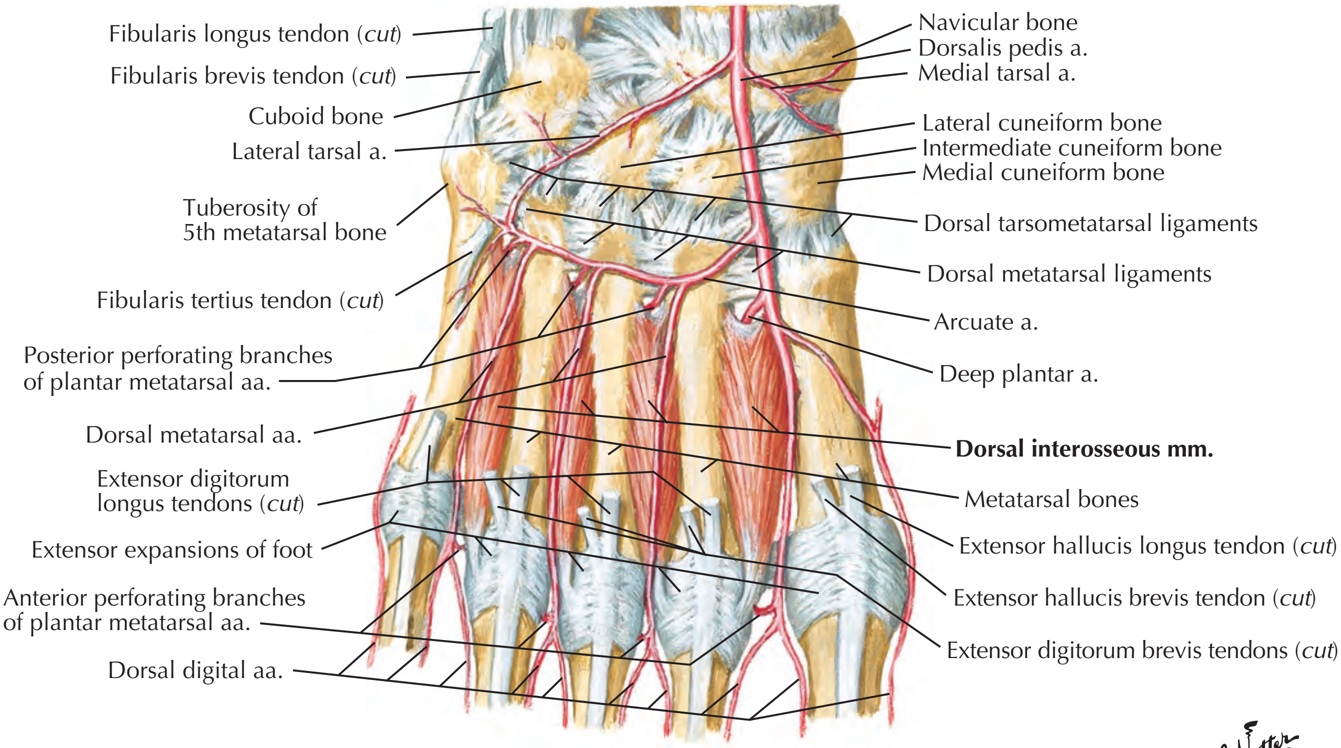
See also **Plate BP 109**


Third layer of muscles in bold
Proper plantar digital branches of medial plantar n.
Proper plantar digital branches of lateral plantar n.
Proper plantar digital branch of medial plantar a.
Anterior perforating branches of plantar metatarsal aa.
Lumbrical tendons (*cut*)
Sesamoid bones of foot
Transverse head of adductor hallucis
Oblique head of adductor hallucis
Medial head of flexor hallucis brevis
Lateral head of flexor hallucis brevis
Superficial branch of medial plantar a.
Flexor hallucis longus tendon (*cut*)
Abductor hallucis (*cut*)
Deep branch of medial plantar a.
Flexor digitorum longus tendon (*cut*)
Tibialis posterior tendon
Medial plantar a. and n.
Flexor hallucis longus tendon
Flexor retinaculum of ankle
Abductor hallucis (*cut*)
Flexor digitorum brevis (*cut*)
Medial calcaneal branches of tibial n.
Calcaneal branch of posterior tibial a.
Flexor digitorum longus tendons (*cut*)
Flexor digitorum brevis tendons (*cut*)
Flexor digiti minimi
Plantar metatarsal aa.
Plantar interosseous mm.
Superficial branch of lateral plantar n.
Plantar arch
Deep branch of lateral plantar n.
Tuberosity of 5th metatarsal bone
Fibularis brevis tendon
Plantar tendinous sheath of fibularis longus m.
Fibularis longus tendon
Quadratus plantae m. (*cut and slightly retracted*)
Lateral plantar a. and n.
Abductor digiti minimi (*cut*)
Plantar aponeurosis (*cut*)
Lateral calcaneal branches of sural n.
Calcaneal branches of fibular a.
Calcaneal tuberosity

Interosseous Muscles and Deep Arteries of Foot

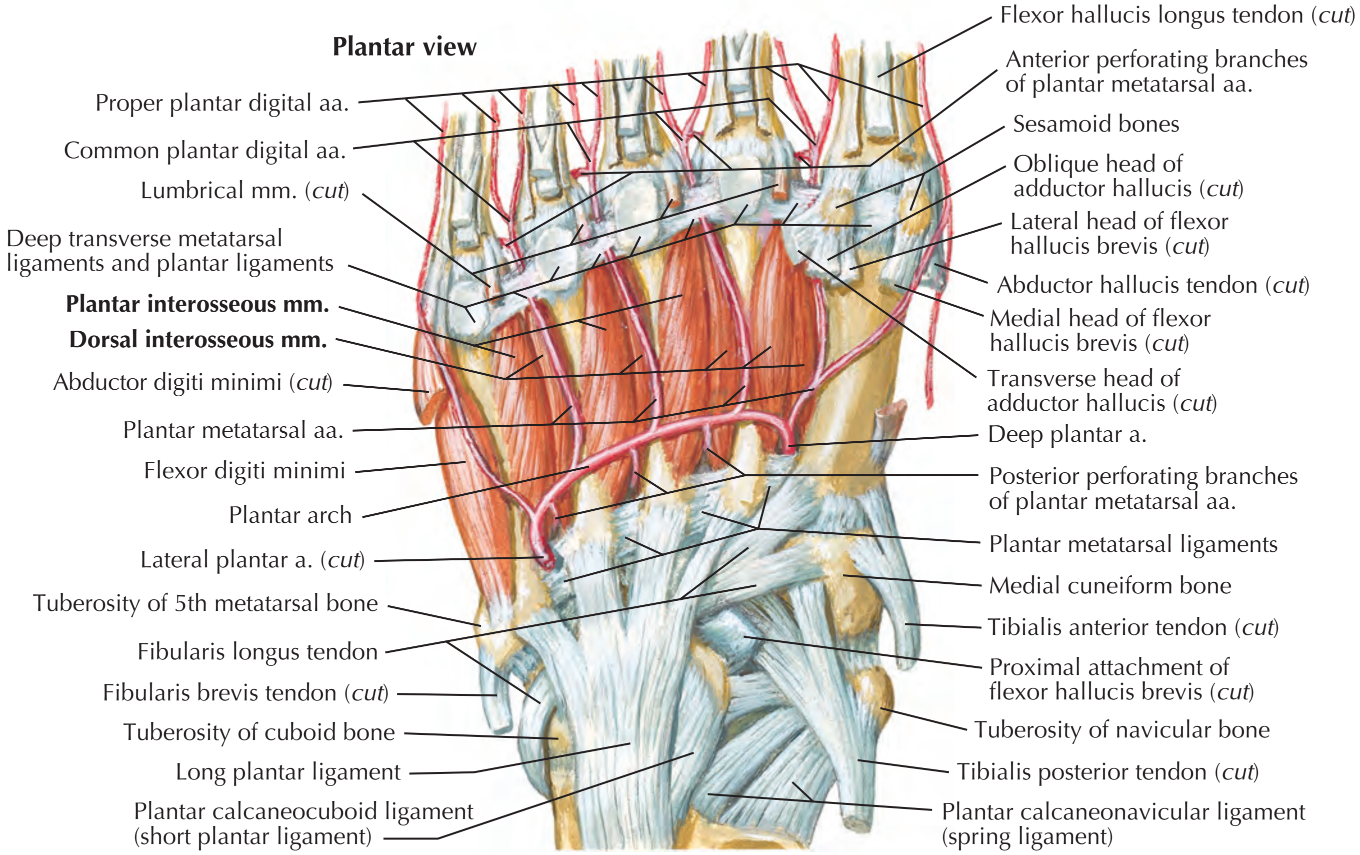
See also **Plates 532, 542, 546, BP 109**

Dorsal view


Fibularis longus tendon (*cut*)
Fibularis brevis tendon (*cut*)
Cuboid bone
Lateral tarsal a.
Tuberosity of 5th metatarsal bone
Fibularis tertius tendon (*cut*)
Posterior perforating branches of plantar metatarsal aa.
Dorsal metatarsal aa.
Extensor digitorum longus tendons (*cut*)
Extensor expansions of foot
Anterior perforating branches of plantar metatarsal aa.
Dorsal digital aa.
Navicular bone
Dorsalis pedis a.
Medial tarsal a.
Lateral cuneiform bone
Intermediate cuneiform bone
Medial cuneiform bone
Dorsal tarsometatarsal ligaments
Dorsal metatarsal ligaments
Arcuate a.
Deep plantar a.
Dorsal interosseous mm.
Metatarsal bones
Extensor hallucis longus tendon (*cut*)
Extensor hallucis brevis tendon (*cut*)
Extensor digitorum brevis tendons (*cut*)

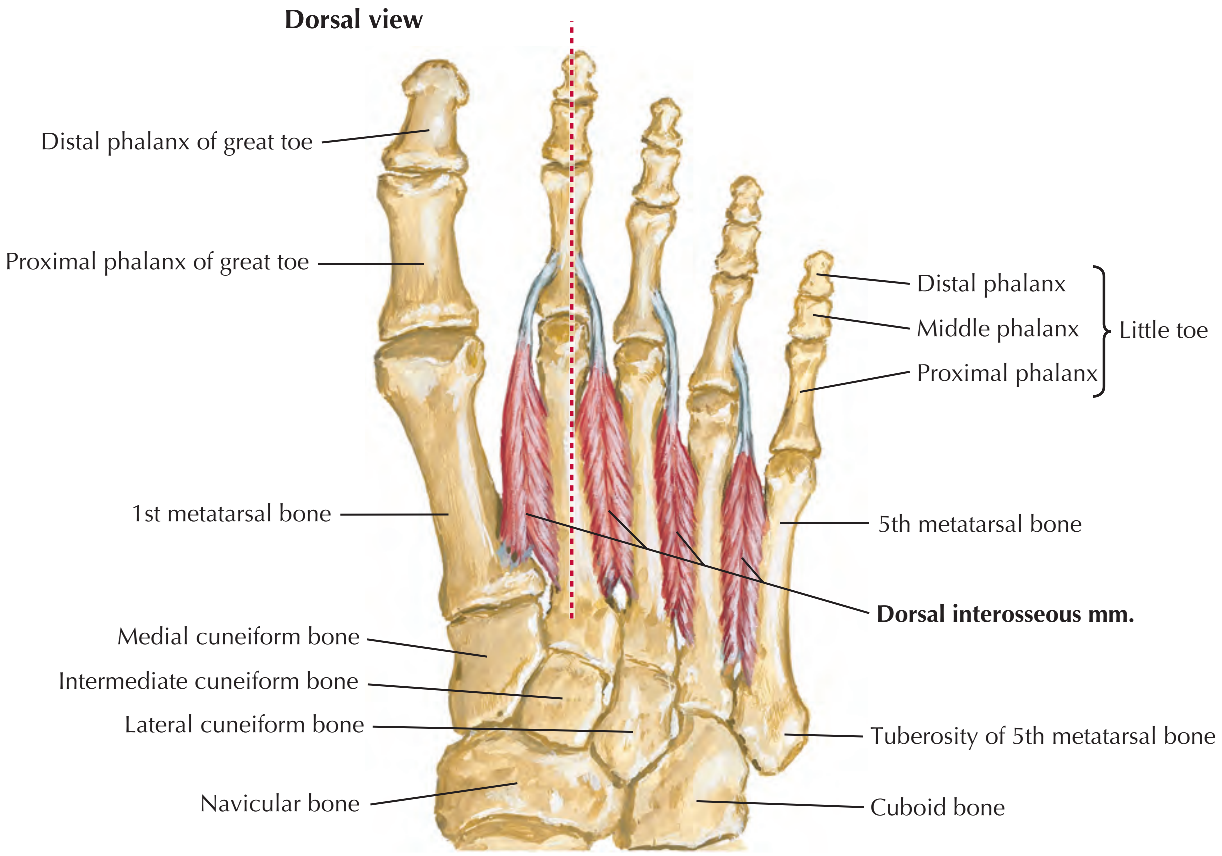
F. Netter M.D.

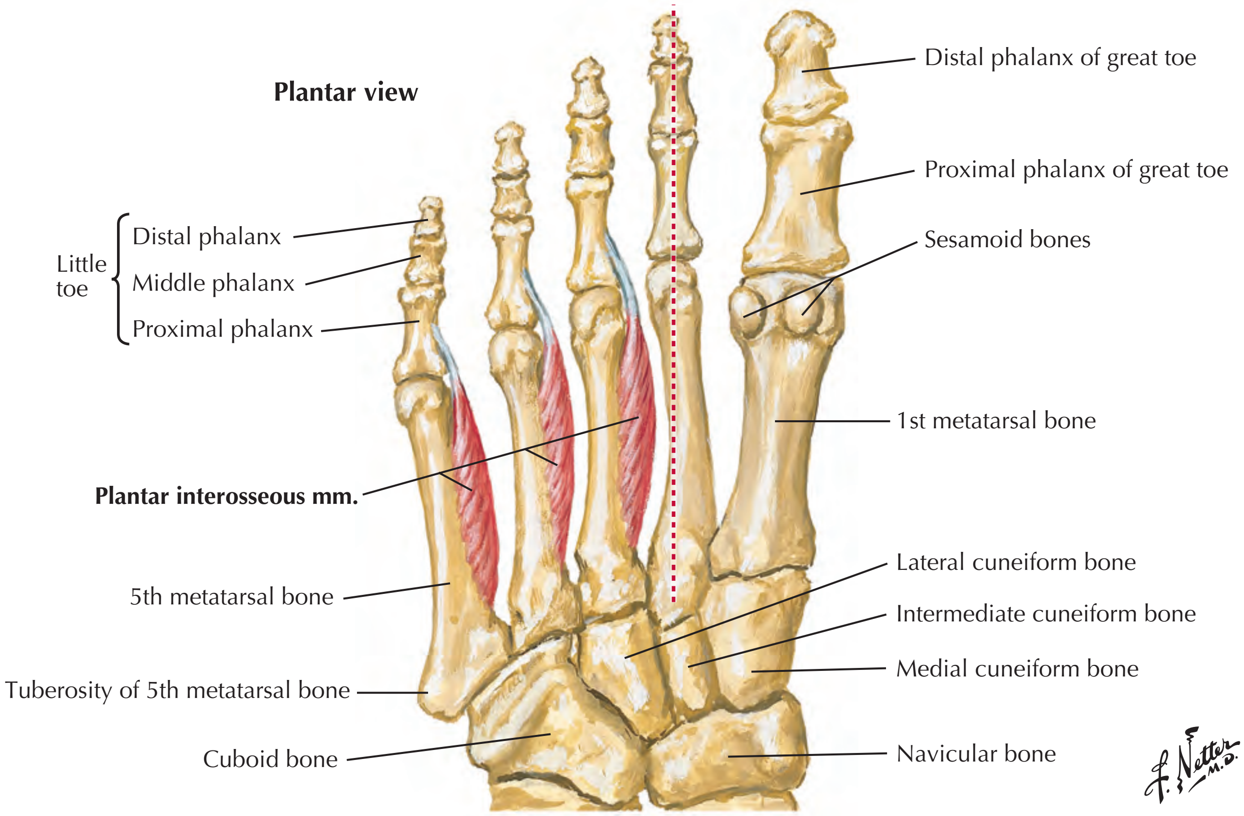
Plantar view


Proper plantar digital aa.
Common plantar digital aa.
Lumbrical mm. (*cut*)
Deep transverse metatarsal ligaments and plantar ligaments
Plantar interosseous mm.
Dorsal interosseous mm.
Abductor digiti minimi (*cut*)
Plantar metatarsal aa.
Flexor digiti minimi
Plantar arch
Lateral plantar a. (*cut*)
Tuberosity of 5th metatarsal bone
Fibularis longus tendon
Fibularis brevis tendon (*cut*)
Tuberosity of cuboid bone
Long plantar ligament
Plantar calcaneocuboid ligament (short plantar ligament)
Flexor hallucis longus tendon (*cut*)
Anterior perforating branches of plantar metatarsal aa.
Sesamoid bones
Oblique head of adductor hallucis (*cut*)
Lateral head of flexor hallucis brevis (*cut*)
Abductor hallucis tendon (*cut*)
Medial head of flexor hallucis brevis (*cut*)
Transverse head of adductor hallucis (*cut*)
Deep plantar a.
Posterior perforating branches of plantar metatarsal aa.
Plantar metatarsal ligaments
Medial cuneiform bone
Tibialis anterior tendon (*cut*)
Proximal attachment of flexor hallucis brevis (*cut*)
Tuberosity of navicular bone
Tibialis posterior tendon (*cut*)
Plantar calcaneonavicular ligament (spring ligament)

Fourth layer of muscles in bold

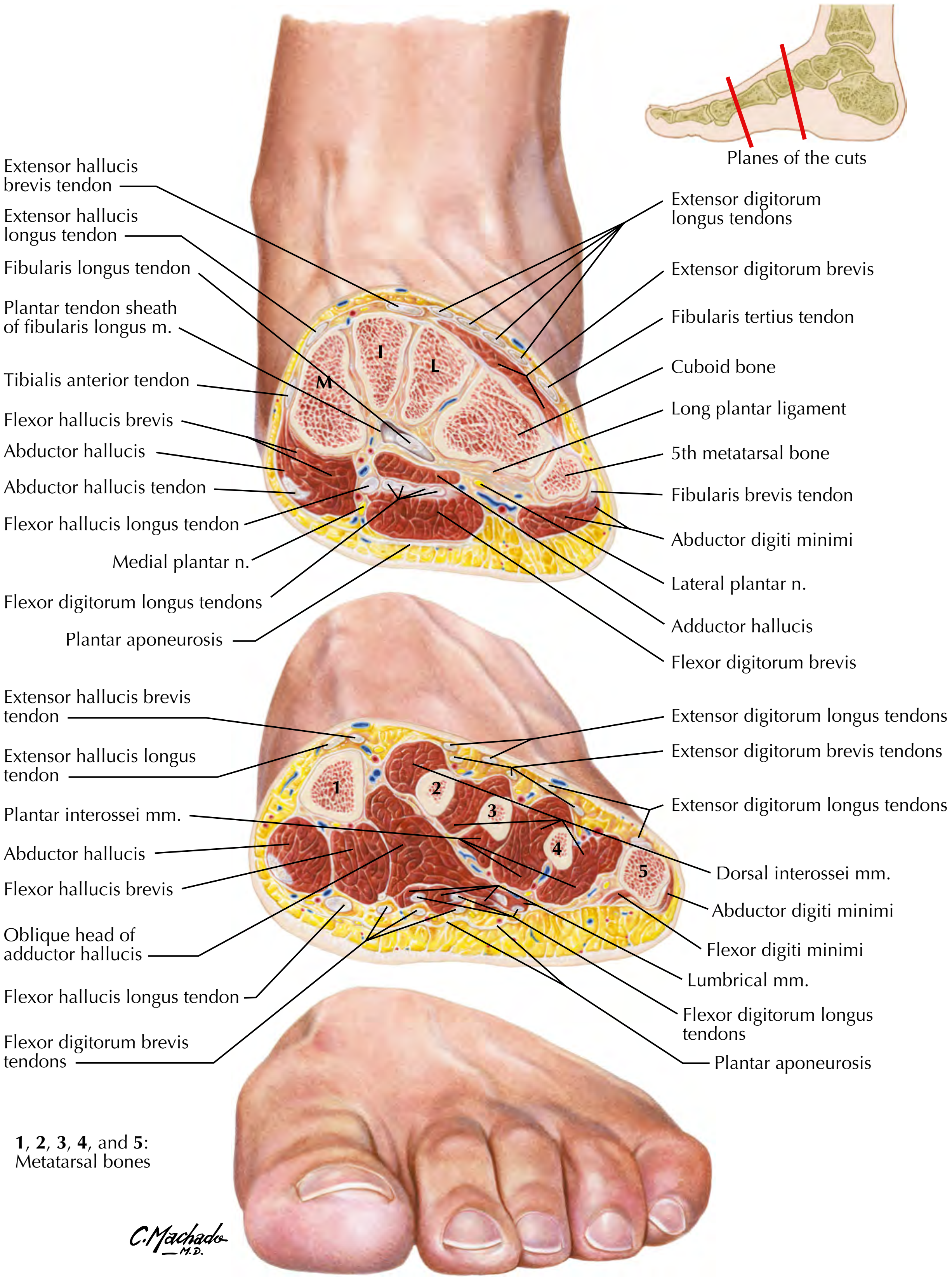
See also **Plate 547**


Dorsal view
Distal phalanx of great toe
Proximal phalanx of great toe
1st metatarsal bone
Medial cuneiform bone
Intermediate cuneiform bone
Lateral cuneiform bone
Navicular bone
Distal phalanx
Middle phalanx
Proximal phalanx
Little toe
5th metatarsal bone
Dorsal interosseous mm.
Tuberosity of 5th metatarsal bone
Cuboid bone


Plantar view
Little toe
Distal phalanx
Middle phalanx
Proximal phalanx
Plantar interosseous mm.
5th metatarsal bone
Tuberosity of 5th metatarsal bone
Cuboid bone
Distal phalanx of great toe
Proximal phalanx of great toe
Sesamoid bones
1st metatarsal bone
Lateral cuneiform bone
Intermediate cuneiform bone
Medial cuneiform bone
Navicular bone

Note: dashed line is the line of reference for abduction and adduction of the toes

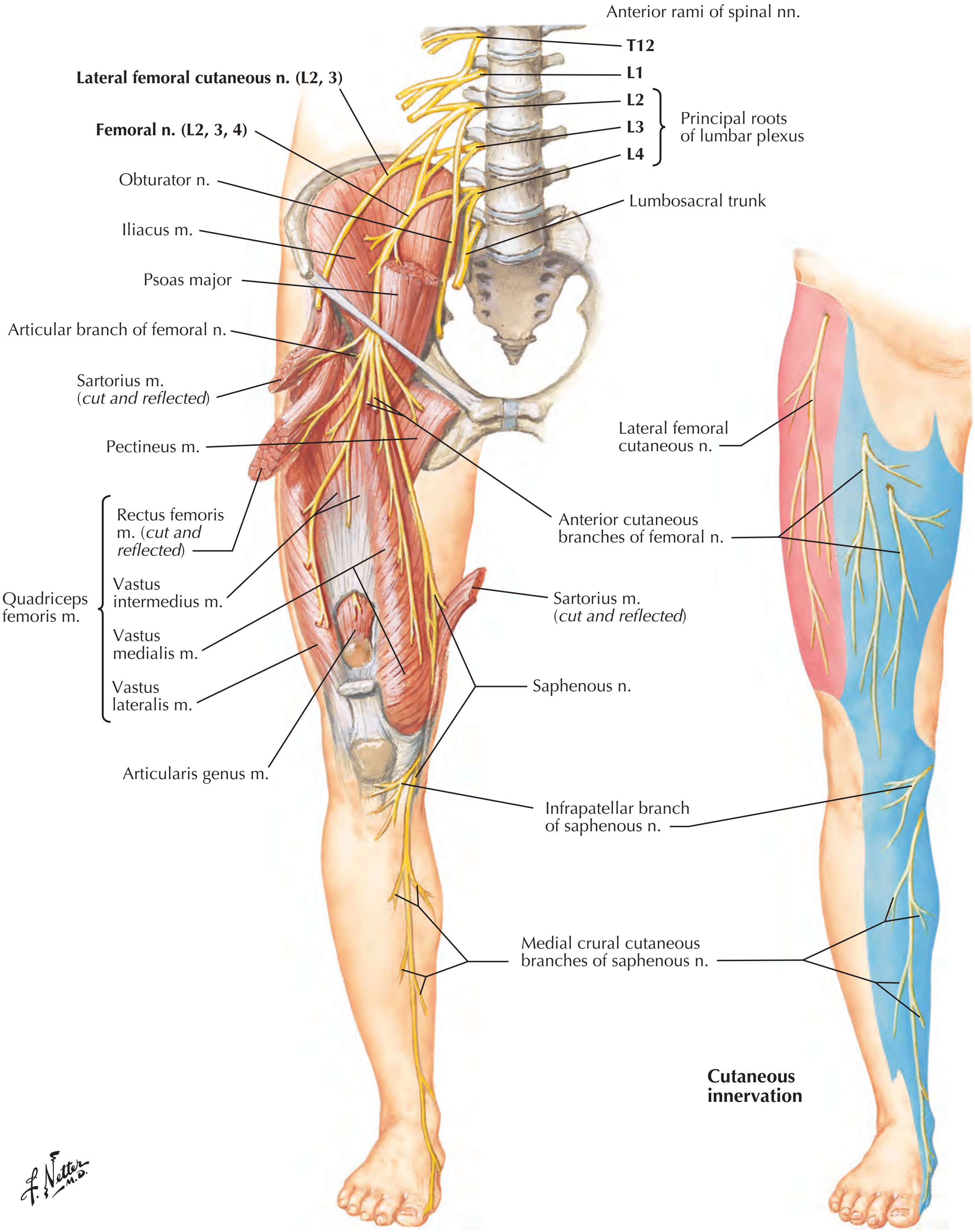
M = Medial cuneiform bone
I = Intermediate cuneiform bone
L = Lateral cuneiform bone


Planes of the cuts
Extensor hallucis brevis tendon
Extensor hallucis longus tendon
Fibularis longus tendon
Plantar tendon sheath of fibularis longus m.
Tibialis anterior tendon
Flexor hallucis brevis
Abductor hallucis
Abductor hallucis tendon
Flexor hallucis longus tendon
Medial plantar n.
Flexor digitorum longus tendons
Plantar aponeurosis
M
I
L
Extensor digitorum longus tendons
Extensor digitorum brevis
Fibularis tertius tendon
Cuboid bone
Long plantar ligament
5th metatarsal bone
Fibularis brevis tendon
Abductor digiti minimi
Lateral plantar n.
Adductor hallucis
Flexor digitorum brevis
Extensor hallucis brevis tendon
Extensor hallucis longus tendon
Plantar interossei mm.
Abductor hallucis
Flexor hallucis brevis
Oblique head of adductor hallucis
Flexor hallucis longus tendon
Flexor digitorum brevis tendons
1
2
3
4
5
Extensor digitorum longus tendons
Extensor digitorum brevis tendons
Extensor digitorum longus tendons
Dorsal interossei mm.
Abductor digiti minimi
Flexor digiti minimi
Lumbrical mm.
Flexor digitorum longus tendons
Plantar aponeurosis

1, **2**, **3**, **4**, and **5**: Metatarsal bones

Femoral Nerve and Lateral Femoral Cutaneous Nerve

See also **Plates 287, 509, 510**

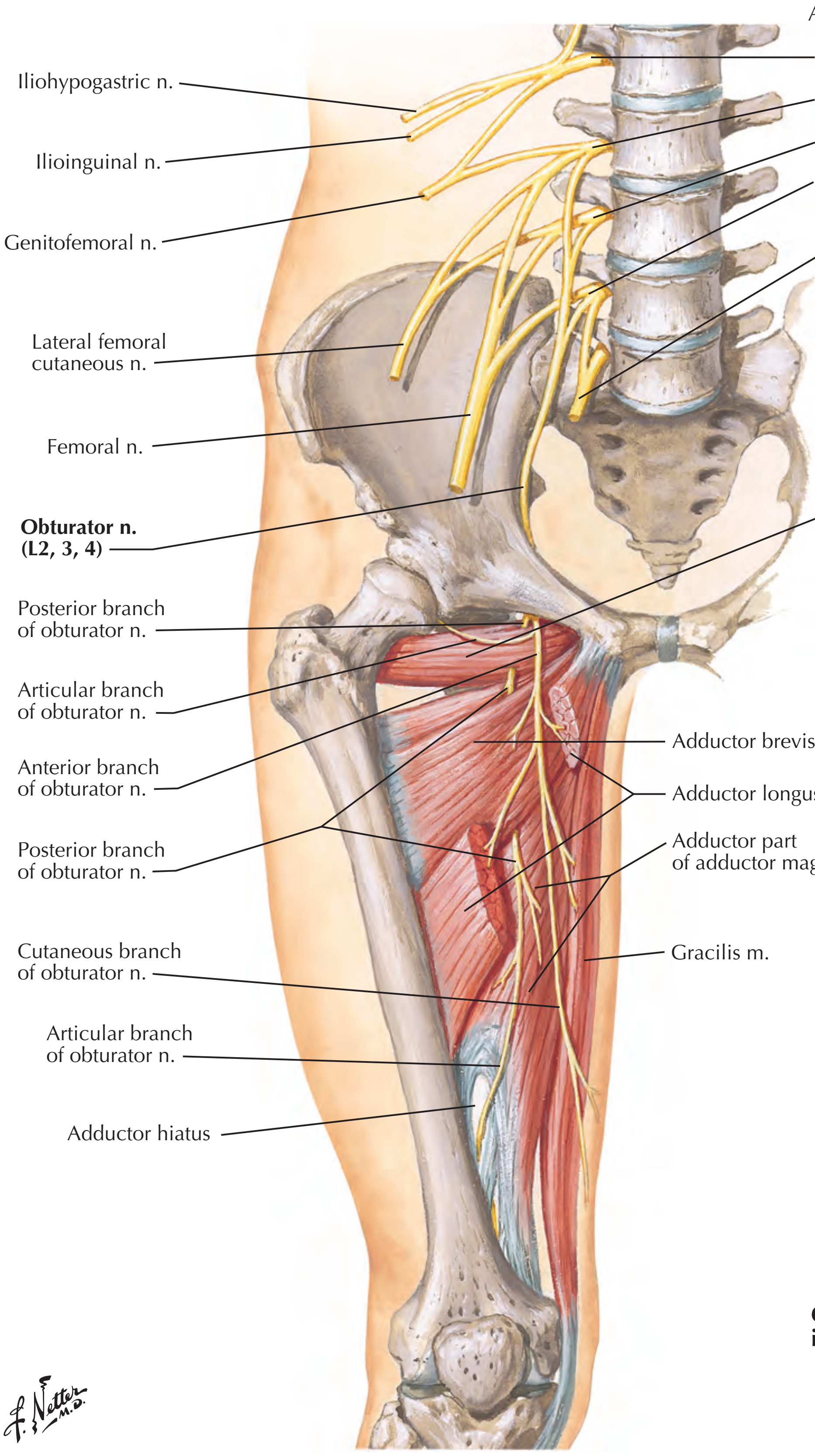


Anterior rami of spinal nn.
T12
L1
L2
L3
L4
Principal roots of lumbar plexus
Lateral femoral cutaneous n. (L2, 3)
Femoral n. (L2, 3, 4)
Obturator n.
Iliacus m.
Psoas major
Articular branch of femoral n.
Sartorius m. (*cut and reflected*)
Pectineus m.
Lumbosacral trunk
Anterior cutaneous branches of femoral n.
Quadriceps femoris m.
Rectus femoris m. (*cut and reflected*)
Vastus intermedius m.
Vastus medialis m.
Vastus lateralis m.
Sartorius m. (*cut and reflected*)
Saphenous n.
Articularis genus m.
Infrapatellar branch of saphenous n.
Medial crural cutaneous branches of saphenous n.

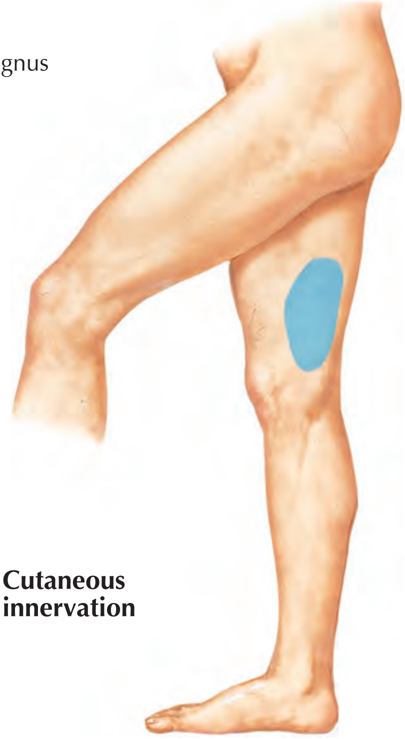
Lateral femoral cutaneous n.
Cutaneous innervation

Obturator Nerve

See also **Plate 510**


Anterior rami of spinal nn.
L1
L2
L3
L4
Principal roots of lumbar plexus
Lumbosacral trunk
Iliohypogastric n.
Ilioinguinal n.
Genitofemoral n.
Lateral femoral cutaneous n.
Femoral n.
Obturator n. (L2, 3, 4)
Obturator externus
Posterior branch of obturator n.
Articular branch of obturator n.
Anterior branch of obturator n.
Posterior branch of obturator n.
Cutaneous branch of obturator n.
Articular branch of obturator n.
Adductor hiatus
Adductor brevis
Adductor longus (*cut*)
Adductor part of adductor magnus
Gracilis m.
F. Netter M.D.

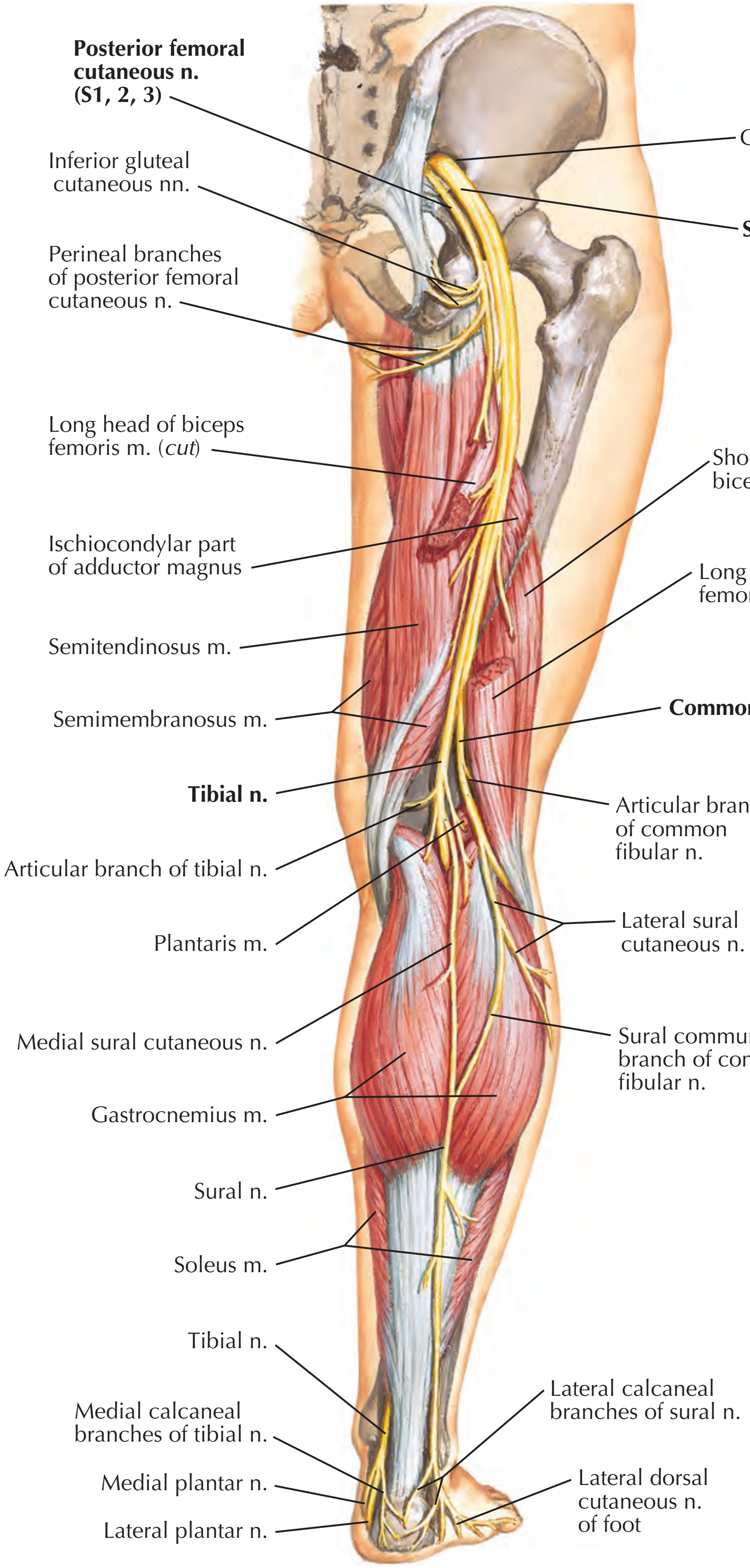
Note: Only muscles innervated by obturator nerve shown



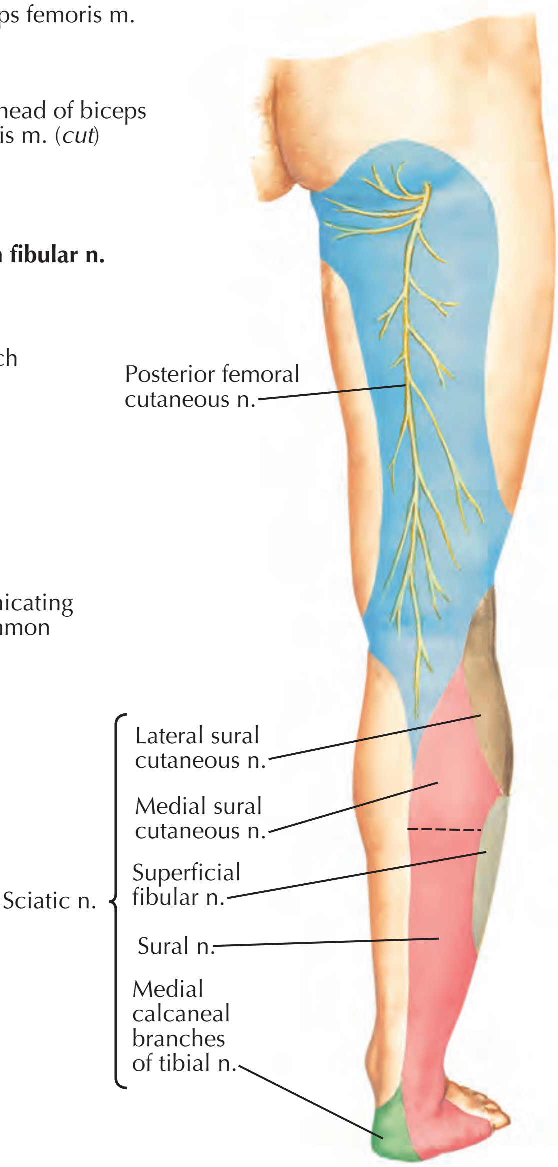
Cutaneous innervation

Sciatic Nerve and Posterior Femoral Cutaneous Nerve

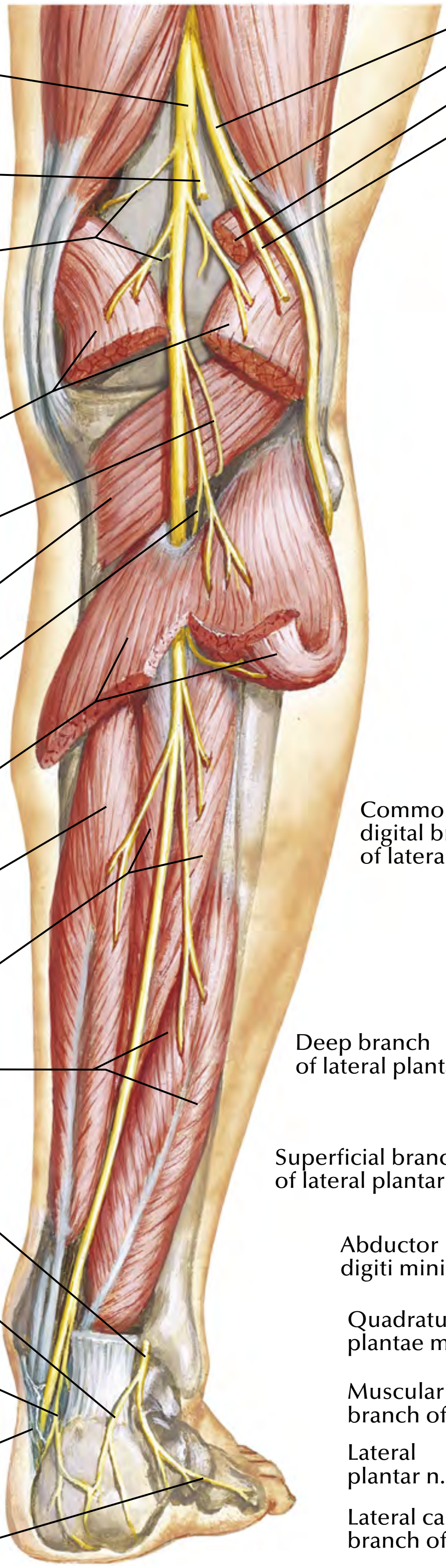
See also **Plate 511**

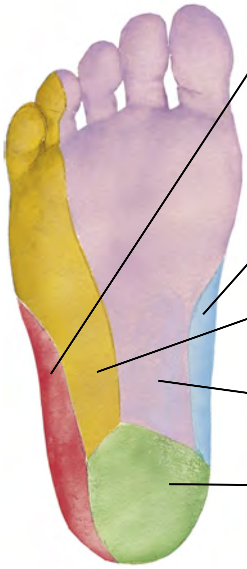

Posterior femoral cutaneous n. (S1, 2, 3)
Inferior gluteal cutaneous nn.
Perineal branches of posterior femoral cutaneous n.
Long head of biceps femoris m. (*cut*)
Ischiocondylar part of adductor magnus
Semitendinosus m.
Semimembranosus m.
Tibial n.
Articular branch of tibial n.
Plantaris m.
Medial sural cutaneous n.
Gastrocnemius m.
Sural n.
Soleus m.
Tibial n.
Medial calcaneal branches of tibial n.
Medial plantar n.
Lateral plantar n.
Greater sciatic foramen
Sciatic n. (L4, 5, S1, 2, 3)
Short head of biceps femoris m.
Long head of biceps femoris m. (*cut*)
Common fibular n.
Articular branch of common fibular n.
Lateral sural cutaneous n.
Sural communicating branch of common fibular n.
Lateral calcaneal branches of sural n.
Lateral dorsal cutaneous n. of foot

Cutaneous innervation

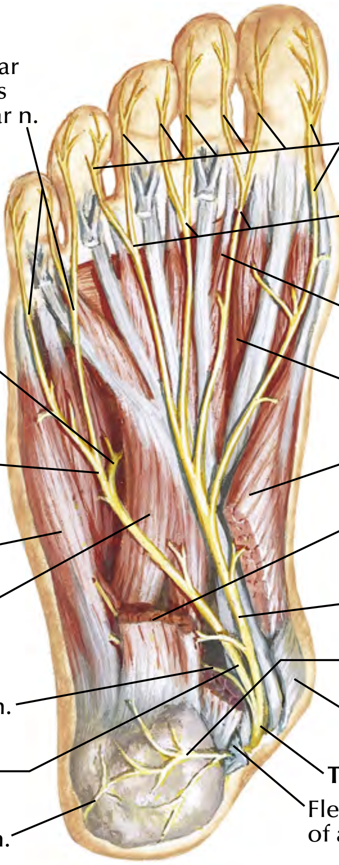

Posterior femoral cutaneous n.
Sciatic n.
Lateral sural cutaneous n.
Medial sural cutaneous n.
Superficial fibular n.
Sural n.
Medial calcaneal branches of tibial n.

See also **Plates 527, 544, 545**


Tibial n.
(L4, 5, S1, 2, 3)
Medial sural cutaneous n. (*cut*)
Articular branches of tibial n.
Gastrocnemius m. (*cut*)
Muscular branch of tibial n.
Popliteus m.
Crural interosseous n.
Soleus m. (*cut and partly retracted*)
Flexor digitorum longus
Tibialis posterior m.
Flexor hallucis longus
Sural n. (*cut*)
Lateral calcaneal branch of sural n.
Medial calcaneal branch of tibial n.
Flexor retinaculum of ankle (*cut*)
Lateral dorsal cutaneous n. of foot
Common fibular n.
Articular branch of common fibular n.
Plantaris m. (*cut*)
Lateral sural cutaneous n. (*cut*)

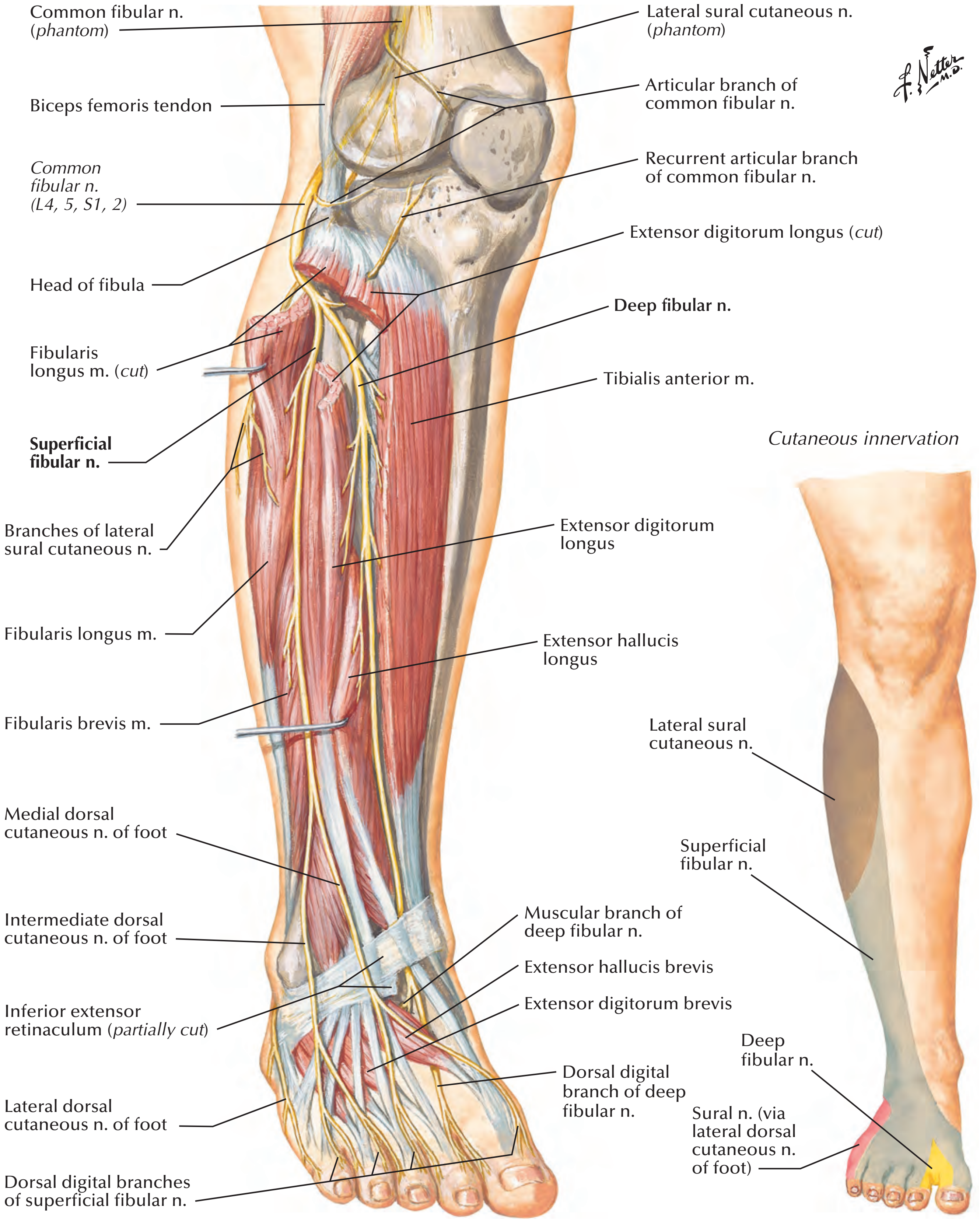

Sural n. (via lateral calcaneal branches and lateral dorsal cutaneous n. of foot)
Saphenous n.
Lateral plantar n.
Medial plantar n.
Medial calcaneal branches
Tibial n.

Cutaneous innervation of plantar region


Common plantar digital branches of lateral plantar n.
Deep branch of lateral plantar n.
Superficial branch of lateral plantar n.
Abductor digiti minimi
Quadratus plantae m.
Muscular branch of tibial n.
Lateral plantar n.
Lateral calcaneal branch of sural n.
Proper plantar digital branches of medial plantar n.
Common plantar digital branches of medial plantar n.
1st lumbrical m.
Flexor hallucis brevis
Abductor hallucis
Flexor digitorum brevis (*cut*)
Medial plantar n.
Medial calcaneal branch of tibial n.
Flexor retinaculum of ankle (*cut*)
Tibial n.
Flexor retinaculum of ankle (*cut*)

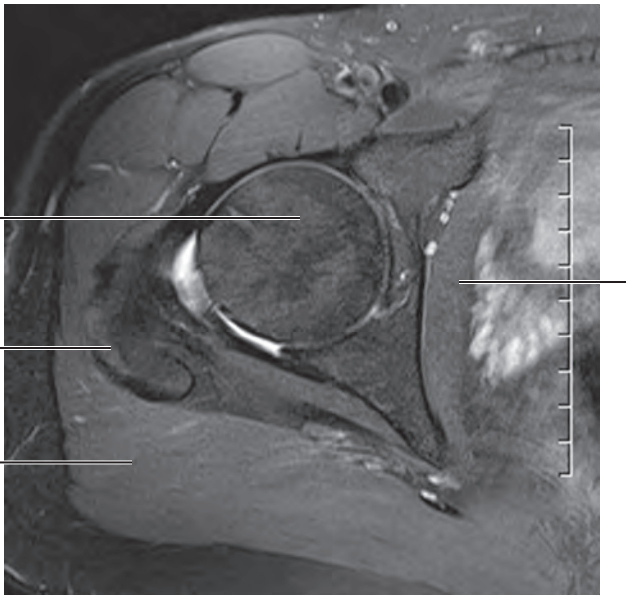
Common Fibular Nerve

See also **Plates 530, 532**

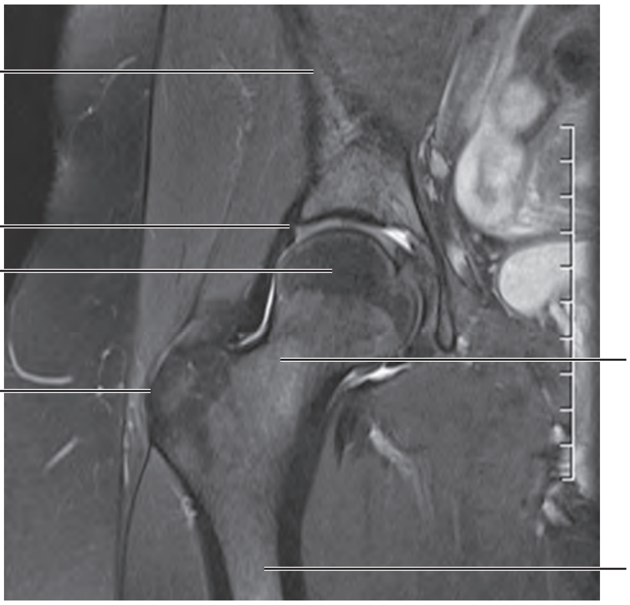

Common fibular n. (*phantom*)
Biceps femoris tendon
Common fibular n. (L4, 5, S1, 2)
Head of fibula
Fibularis longus m. (*cut*)
Superficial fibular n.
Branches of lateral sural cutaneous n.
Fibularis longus m.
Fibularis brevis m.
Medial dorsal cutaneous n. of foot
Intermediate dorsal cutaneous n. of foot
Inferior extensor retinaculum (*partially cut*)
Lateral dorsal cutaneous n. of foot
Dorsal digital branches of superficial fibular n.
Lateral sural cutaneous n. (*phantom*)
Articular branch of common fibular n.
Recurrent articular branch of common fibular n.
Extensor digitorum longus (*cut*)
Deep fibular n.
Tibialis anterior m.
Extensor digitorum longus
Extensor hallucis longus
Muscular branch of deep fibular n.
Extensor hallucis brevis
Extensor digitorum brevis
Dorsal digital branch of deep fibular n.
Cutaneous innervation
Lateral sural cutaneous n.
Superficial fibular n.
Deep fibular n.
Sural n. (via lateral dorsal cutaneous n. of foot)

See also **Plates 353, 420, 514**

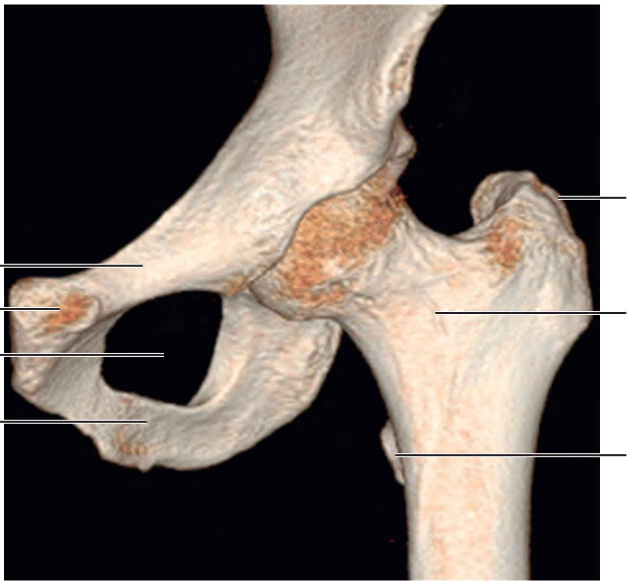
Axial T2-weighted MRI


Head of femur
Greater trochanter
Gluteus maximus m.
Obturator internus

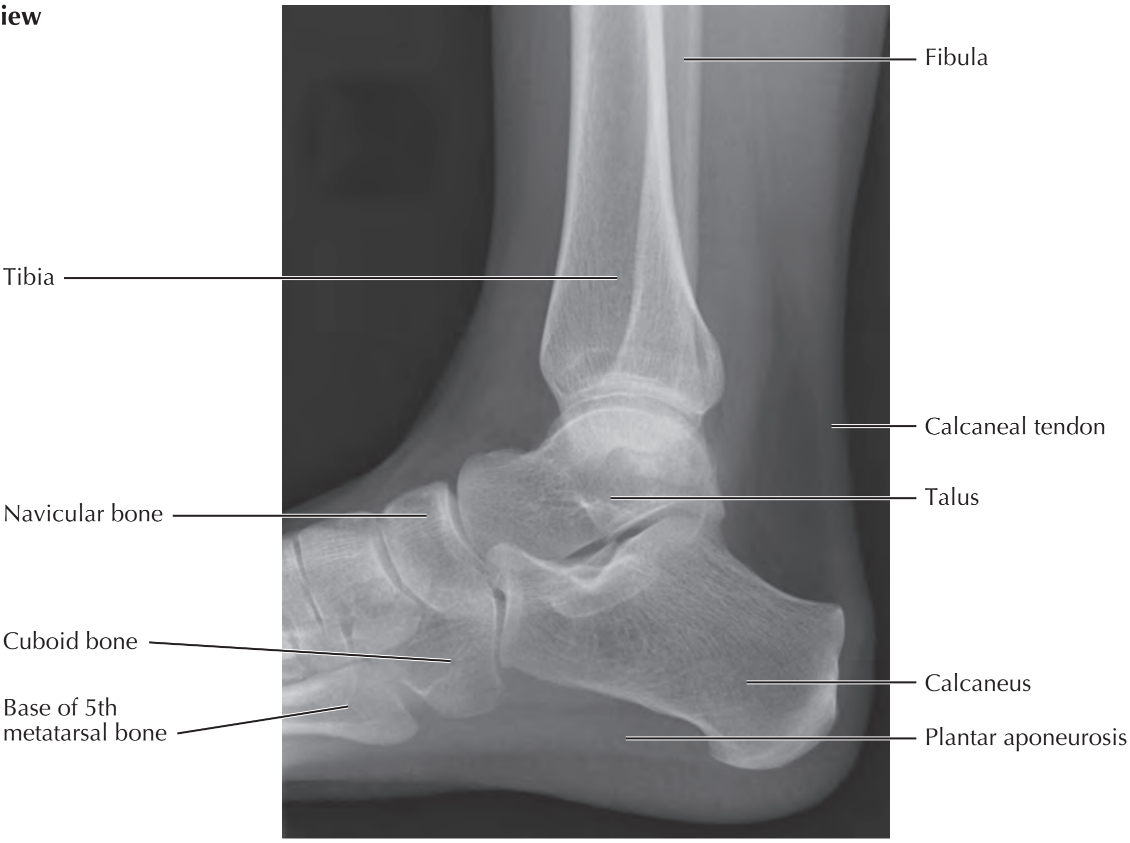
Coronal T2-weighted MRI


Ala of ilium
Acetabular labrum
Head of femur
Greater trochanter
Neck of femur
Femur

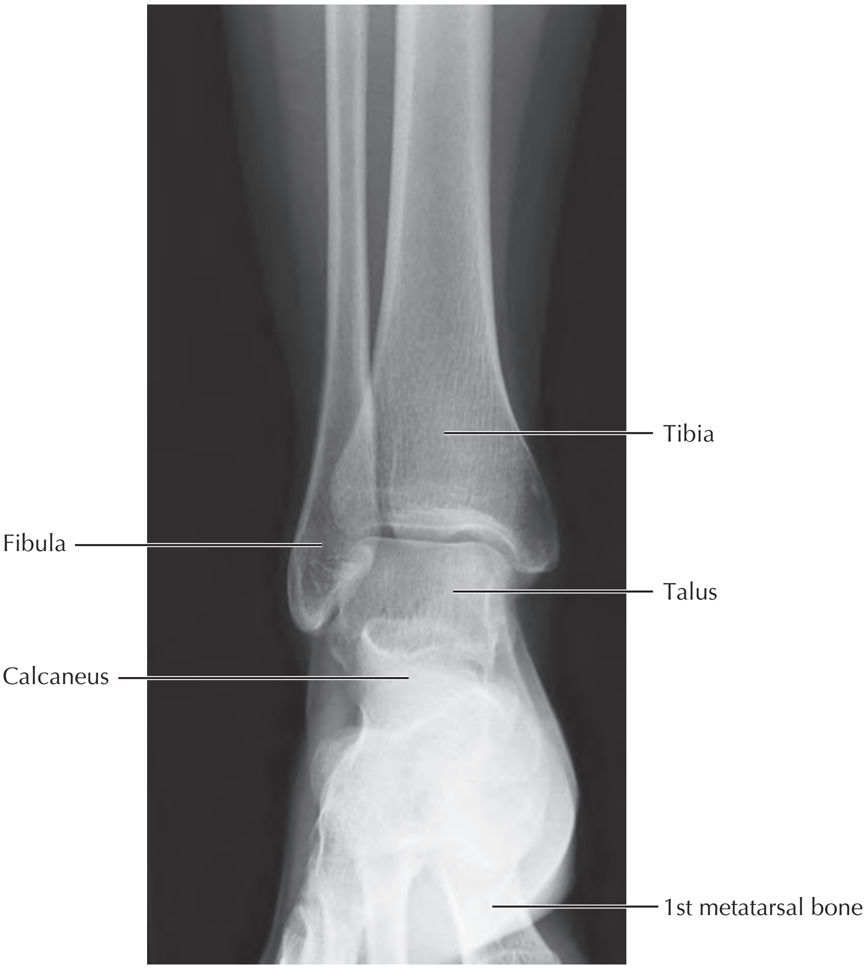
3D CT of hip


Greater trochanter
Superior pubic ramus
Pubic tubercle
Obturator foramen
Neck of femur
Ischiopubic ramus
Lesser trochanter

Lateral view


Fibula
Tibia
Calcaneal tendon
Talus
Navicular bone
Cuboid bone
Calcaneus
Base of 5th metatarsal bone
Plantar aponeurosis

Anterior view


Tibia
Fibula
Talus
Calcaneus
1st metatarsal bone

ANATOMICAL STRUCTURE	CLINICAL COMMENT	PLATE NUMBERS
Nervous System and Sense Organs		
Sural nerve	Nerve is commonly biopsied for peripheral neuropathies and commonly used as donor graft in neurotization procedures	493, 552
Common fibular nerve	Injury to this nerve from blunt trauma or compression by leg cast weakens dorsiflexion and results in foot drop	550, 552, 554
Obturator nerve	Nerve is blocked or transected for adductor muscle spasticity in cerebral palsy; may be injured during pelvic fractures or pelvic surgical procedures such as lymphadenectomy	551
Femoral nerve	Can be compressed from femoral artery hematoma and can be anesthetized for procedures of lower limb just below inguinal ligament	507, 509, 550
Saphenous nerve	Can be anesthetized in adductor canal to provide pain relief after knee replacement surgery	492, 509, 550
Lateral femoral cutaneous nerve	Compression at inguinal ligament leads to meralgia paresthetica, a pain and paresthesia syndrome of anterolateral thigh; risk factors include obesity, pregnancy, and tight-fitting waistbands	509, 550
Skeletal System		
Neck of femur	Common fracture in elderly persons from falls; can lead to avascular necrosis of head of femur because of disrupted blood supply	497, 500, 514
Body of femur	Midbody is common fracture site in high-energy trauma (motor vehicle collisions)	500
Hip joint	Potential for avascular necrosis of head of femur in hip dislocations or fractures	496, 514
Anterior cruciate ligament	Most commonly injured knee ligament, typically from sudden pivot of knee causing excessive valgus stress coupled with medial rotation of tibia	517-519
Tibial (medial) collateral and anterior cruciate ligaments and medial meniscus	"Unhappy triad of the knee"; damage to these structures can result from blow to lateral aspect of joint in extension	517-519
Tibia and fibula	High-energy fractures of body (boot-top skiing fracture) from falling forward at high speed	524
First metatarsophalangeal joint	Joint misalignment leads to hallux valgus (bunion); wearing narrow shoes can contribute, though there is also a strong genetic component	535
Calcaneus	Most common tarsal bone fracture, usually caused by landing forcefully on heel after falling from height	537
Ankle joint	Most sprains are inversion injuries that occur when foot is plantar flexed, placing stress on lateral collateral ligaments of ankle; fractures often occur to lateral malleolus of fibula and inferior articular surface of tibia	538
Muscular System		
Muscles of medial compartment of thigh	Excessive stretching or tearing of adductor and gracilis muscles is common in sports that require repeated sprints or quick changes in direction (e.g., soccer, hockey)	502, 503
Patellar ligament	Striking patellar ligament with reflex hammer elicits patellar (knee jerk) reflex to test L3 to L4 spinal cord levels (innervation of quadriceps femoris muscle by femoral nerve)	502, 517
Iliotibial tract	Can cause lateral knee pain in runners when tight iliotibial tract rubs repetitively across lateral epicondyle of femur (iliotibial band syndrome)	501, 516

ANATOMICAL STRUCTURE	CLINICAL COMMENT	PLATE NUMBERS
Muscular System—Continued		
Semitendinosus and semimembranosus muscles and long head of biceps femoris muscle	Excessive stretching or tearing of hamstring muscles occurs most often during high-speed running or activities with high kicks	504
Piriformis muscle	Piriformis muscle strain or structural variations (e.g., split piriformis muscle) may produce compression of sciatic nerve	511
Gluteus medius and minimus muscles	Paralysis results in contralateral pelvic dip due to weakened hip abduction when standing on affected limb (Trendelenburg sign or gait)	512
Calcaneal (Achilles') tendon	Inflammation results from repetitive stress on tendon, often from running on uneven surfaces; extreme stress may cause tendon to rupture; striking calcaneal tendon with reflex hammer elicits ankle (ankle jerk) reflex to test S1–S2 spinal cord levels (innervation of superficial calf muscles by tibial nerve)	527, 528, 538
Compartments of leg	Acute compartment syndrome may occur after trauma, such as long bone fracture, that increases compartment pressure and thereby compromises vascular flow; symptoms include pain, paresthesias, pallor, pulselessness, and paralysis (five P's); fasciotomy often required to relieve pressure	534
Plantar aponeurosis	Inflammation results from increased tension, weight, or overuse, causing heel and foot pain (plantar fasciitis)	543
Cardiovascular System		
Femoral vein	Common site of vascular access for central venous catheters; however, risk of catheter infection is greater than with jugular or subclavian vein access	509
Deep veins of lower limb	Venous thrombosis of deep leg veins is due to venous stasis, vessel injury, and/or coagulation disorders (Virchow's triad); can lead to thrombus formation and thromboemboli, such as to the lungs	533
Great saphenous vein	Often used as graft in coronary artery bypass surgery	492
Superficial veins of lower limb	Varicose veins are dilated, tortuous superficial veins, often associated with reflux of superficial and/or deep veins; progressive venous disease may cause edema, pain, and ulceration	492, 533
Femoral artery	Common site of vascular access for percutaneous cardiac and vascular procedures; target is segment between origins of inferior epigastric and deep femoral arteries, generally identified using fluoroscopy by its location alongside the femoral head; "high stick" (too cephalad) may result in retroperitoneal hemorrhage	522
Femoral, popliteal, tibial, and fibular arteries	Peripheral arterial disease due to atherosclerosis may occur in major arteries of lower limb, resulting in reduced blood flow; patients experience claudication (cramping pain in thigh or calf) upon exertion	522
Arteries of lower limb	Pulse points: femoral artery in femoral triangle, popliteal artery in deep popliteal region of knee, anterior tibial artery between extensor hallucis longus and extensor digitorum longus at ankle joint, dorsalis pedis artery on dorsum of foot, and posterior tibial artery in tarsal tunnel posterior to medial malleolus	14, 509, 527, 540, 541
Lymph Vessels and Lymphoid Organs		
Superficial inguinal nodes	Superficial inguinal nodes drain lower limb, gluteal region, lower abdominal region, and perineum; are palpable when enlarged	494
Lymph vessels of lower limb	Lymphedema (stasis of lymph flow in lymph vessels obstructed by inflammation, fibrosis, tumor, or abnormally small diameter)	494

*Selections were based largely on clinical data and commonly discussed clinical correlations in macroscopic ("gross") anatomy courses.

The lumbosacral plexus includes the lumbar, sacral, and coccygeal plexuses, whose roots are the anterior rami of spinal nerves (lumbar plexus: typically L2–L4 with a small contribution from L1; sacral plexus: L4–S4; coccygeal plexus: S4–Co). Variation in the spinal nerve contributions to the plexuses, and the nerves that arise from these plexuses, is common and can be due to a prefixed (high) or postfixed (low) plexus.

NERVE	ORIGIN	COURSE	BRANCHES	MOTOR	CUTANEOUS
Lateral femoral cutaneous nerve	Posterior divisions of lumbar plexus (L2–L3)	Courses posterior to or through inguinal ligament medial to anterior superior iliac spine, then travels superficially in lateral thigh			Lateral thigh
Femoral nerve	Posterior divisions of lumbar plexus (L2–L4)	Passes posterior to inguinal ligament to lie on iliacus muscle in femoral triangle	Muscular and anterior cutaneous branches, saphenous nerve	Anterior compartment of thigh, iliacus and pectineus muscles	Anterior thigh
Saphenous nerve	Femoral nerve	Leaves femoral nerve in adductor canal, pierces fascia lata to travel superficially with great saphenous vein	Infrapatellar and medial crural cutaneous branches		Medial knee, leg, ankle, and foot
Genitofemoral nerve	Anterior divisions of lumbar plexus (L1–L2)	Runs on anterior surface of psoas major; genital branch traverses inguinal canal; femoral branch courses into femoral triangle by passing deep to inguinal ligament	Genital and femoral branches	Cremaster	Lateral part of femoral triangle, anterior scrotum/vulva
Obturator nerve	Anterior divisions of lumbar plexus (L2–L4)	At L5 vertebra passes deep to common iliac vessels, enters medial thigh via obturator foramen	Anterior and posterior branches	Medial compartment of thigh	Medial thigh
Superior gluteal nerve	Posterior divisions of sacral plexus (L4–S1)	Exits pelvis via greater sciatic foramen superior to piriformis muscle		Gluteus medius and minimus muscles, tensor fasciae latae	
Inferior gluteal nerve	Posterior divisions of sacral plexus (L5–S2)	Exits pelvis via greater sciatic foramen inferior to piriformis muscle		Gluteus maximus muscle	
Nerve to piriformis muscle	Posterior divisions of sacral plexus (S1–S2)			Piriformis muscle	
Perforating cutaneous nerve	Posterior divisions of sacral plexus (S2–S3)	Exits pelvis and pierces sacrotuberous ligament			Inferomedial gluteal region
Nerve to obturator internus	Anterior divisions of sacral plexus (L5–S2)	Exits pelvis via greater sciatic foramen, inferior to piriformis muscle; re-enters pelvis via lesser sciatic foramen to innervate obturator internus		Obturator internus and superior gemellus muscle	
Nerve to quadratus femoris muscle	Anterior divisions of sacral plexus (L4–S1)	Exits pelvis via greater sciatic foramen inferior to piriformis muscle		Quadratus femoris and inferior gemellus muscles	
Nerve to levator ani	Anterior divisions of sacral plexus (S3–S4)	From its source, travels on superior surface of levator ani		Iliococcygeus and pubococcygeus muscles	
Nerve to coccygeus muscle	Anterior divisions of sacral plexus (S3–S4)	From its source, travels on superior surface of coccygeus muscle		Coccygeus (ischiococcygeus) muscle	
Pudendal nerve	Anterior divisions of sacral plexus (S2–S4)	Exits pelvis via greater sciatic foramen inferior to piriformis muscle; enters perineum via lesser sciatic foramen, coursing through ischioanal fossa and pudendal (Alcock's) canal	Inferior anal and perineal nerves, dorsal nerve of clitoris or penis	Perineal muscles, external anal sphincter, pubococcygeus muscle	Posterior scrotum/vulva, clitoris or penis
Posterior femoral cutaneous nerve	Anterior and posterior divisions of sacral plexus (S1–S3)	Exits pelvis via greater sciatic foramen inferior to piriformis muscle; runs inferiorly to gluteus maximus muscle and continues distally to popliteal fossa	Inferior gluteal cutaneous nerves, perineal branches		Inferior gluteal region, posterior thigh, popliteal region

Continued

NERVE	ORIGIN	COURSE	BRANCHES	MOTOR	CUTANEOUS
Sciatic nerve	Anterior and posterior divisions of sacral plexus (L4–S3)	Exits pelvis via greater sciatic foramen inferior to piriformis muscle, passing superficial to lateral rotators and deep to gluteus medius muscle to access thigh between greater trochanter of femur and ischial tuberosity	Muscular branches, tibial and common fibular nerves	Posterior compartment of thigh (also see branches)	See branches
Tibial nerve	Sciatic nerve	Courses through popliteal fossa and sural region deep to soleus muscle, traversing tarsal tunnel posterior to medial malleolus	Muscular and medial calcaneal branches, crural interosseous nerve, medial sural cutaneous nerve, medial and lateral plantar nerves	Posterior compartment of leg (also see branches)	Heel (also see branches)
Common fibular nerve	Sciatic nerve	Courses medial to biceps femoris muscle and lateral to lateral head of gastrocnemius muscle and neck of fibula	Superficial and deep fibular nerves, lateral sural cutaneous nerve, sural communicating branch	*See branches*	*See branches*
Deep fibular nerve	Common fibular nerve	Courses deep to fibularis longus muscle and extensor digitorum longus on surface of interosseous membrane of leg deep to extensor retinaculum	Muscular and dorsal digital branches	Anterior compartment of leg	Dorsal aspect of adjacent parts of toes 1 and 2
Superficial fibular nerve	Common fibular nerve	Courses between fibularis longus and brevis muscles in lateral compartment of leg, piercing crural fascia distally	Muscular branches, medial and intermediate dorsal cutaneous nerves of foot	Lateral compartment of leg	Inferior part of anterior leg, dorsum of foot and toes
Lateral sural cutaneous nerve	Common fibular nerve	Branches from common fibular nerve just proximal to plantaris muscle			Lateral leg
Medial sural cutaneous nerve	Tibial nerve	Branches from tibial nerve just proximal to plantaris muscle, runs between both heads of gastrocnemius muscle, pierces crural fascia	Sural nerve		Proximal posterolateral leg
Sural nerve	Union of medial sural cutaneous nerve and sural communicating branch of common fibular nerve	Descends sural region along lateral calcaneal tendon and into foot between lateral malleolus and calcaneus	Lateral dorsal cutaneous nerve of foot		Distal posterolateral leg, lateral foot
Lateral plantar nerve	Tibial nerve	Passes deep to abductor hallucis brevis and travels between flexor digitorum brevis and quadratus plantae muscle	Superficial and deep branches	Abductor digiti minimi, adductor hallucis, flexor digiti minimi, quadratus plantae muscle, dorsal and plantar interossei muscles, lumbrical muscles (lateral three)	Lateral sole, plantar aspect of 5th toe and part of 4th toe
Medial plantar nerve	Tibial nerve	Passes deep to abductor hallucis brevis and runs anteriorly along medial border of flexor digitorum brevis	Muscular and common plantar digital branches	Abductor hallucis, flexor digitorum brevis, flexor hallucis brevis, lumbrical muscles (most medial one)	Medial sole, plantar aspect of toes 1–3, and part of 4th toe

MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT	DISTAL ATTACHMENT	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Abductor digiti minimi of foot	Foot	Medial and lateral tubercles of tuberosity of calcaneus, plantar aponeurosis, intermuscular septum	Lateral surface of base of proximal phalanx of 5th digit	Lateral plantar nerve	Lateral plantar artery, plantar metatarsal and plantar digital arteries to 5th digit	Abducts and flexes 5th digit
Abductor hallucis	Foot	Medial tubercle of tuberosity of calcaneus, flexor retinaculum, plantar aponeurosis	Medial surface of base of proximal phalanx of 1st digit	Medial plantar nerve	Medial plantar and 1st plantar metatarsal arteries	Abducts and flexes 1st digit
Adductor brevis	Medial thigh	Body and inferior ramus of pubis	Pectineal line and proximal part of linea aspera of femur	Obturator nerve	Deep femoral, medial circumflex femoral, and obturator arteries	Adducts thigh at hip, weak hip flexor
Adductor hallucis	Foot	*Oblique head:* bases of 2nd through 4th metatarsals *Transverse head:* ligaments of metatarsophalangeal joints of digits 3–5	Lateral surface of base of proximal phalanx of 1st digit	Lateral plantar nerve	Medial and lateral plantar arteries, plantar arch, plantar metatarsal arteries	Adducts 1st digit, maintains transverse arch of foot
Adductor longus	Medial thigh	Body of pubis inferior to pubic crest	Middle one-third of linea aspera of femur	Obturator nerve	Deep femoral and medial circumflex femoral arteries	Adducts thigh at hip
Adductor magnus	Medial thigh	*Adductor part:* ischiopubic ramus *Hamstring part:* ischial tuberosity	*Adductor part:* gluteal tuberosity, linea aspera, medial supracondylar line *Hamstring part:* adductor tubercle of femur	*Adductor part:* obturator nerve *Hamstring part:* sciatic nerve (tibial division)	Femoral, deep femoral, and obturator arteries	*Adductor part:* adducts and flexes thigh *Hamstring part:* extends thigh
Articularis genus m.	Anterior thigh	Anterior surface of distal femur	Suprapatellar bursa	Femoral nerve	Femoral artery	Pulls suprapatellar bursa superiorly with extension of knee
Biceps femoris m.	Posterior thigh	*Long head:* ischial tuberosity *Short head:* linea aspera and lateral supracondylar line of femur	Lateral surface of head of fibula	*Long head:* sciatic nerve (tibial division) *Short head:* sciatic nerve (common fibular division)	Perforating femoral arteries, inferior gluteal and medial circumflex femoral arteries	Flexes and laterally rotates leg, extends thigh
Dorsal interossei mm. of foot	Foot	Adjacent surfaces of 1st through 5th metatarsals	*Medial one:* medial surface of proximal phalanx of 2nd digit *Lateral three:* lateral surfaces of proximal phalanges of digits 2–4	Lateral plantar nerve	Arcuate artery, dorsal and plantar metatarsal arteries	Abduct 2nd through 4th digits of foot, flex metatarsophalangeal joints, and extend phalanges
Extensor digitorum brevis	Foot	Superolateral surface of calcaneus, lateral talocalcaneal ligament, deep surface of inferior extensor retinaculum	Lateral sides of tendons of extensor digitorum longus to digits 2–4	Deep fibular nerve	Dorsalis pedis, lateral tarsal, arcuate, and fibular arteries	Extends 2nd through 4th digits at metatarsophalangeal and interphalangeal joints
Extensor digitorum longus	Anterior leg	Lateral condyle of tibia, proximal three-fourths of anterior surfaces of interosseous membrane and fibula	Middle and distal phalanges of digits 2–5	Deep fibular nerve	Anterior tibial artery	Extends lateral four digits and dorsiflexes foot
Extensor hallucis brevis	Foot	Superolateral surface of calcaneus	Dorsal surface of proximal phalanx of great toe	Deep fibular nerve	Dorsalis pedis, lateral tarsal, arcuate, and fibular arteries	Extends great toe at metatarsophalangeal and interphalangeal joints

Continued

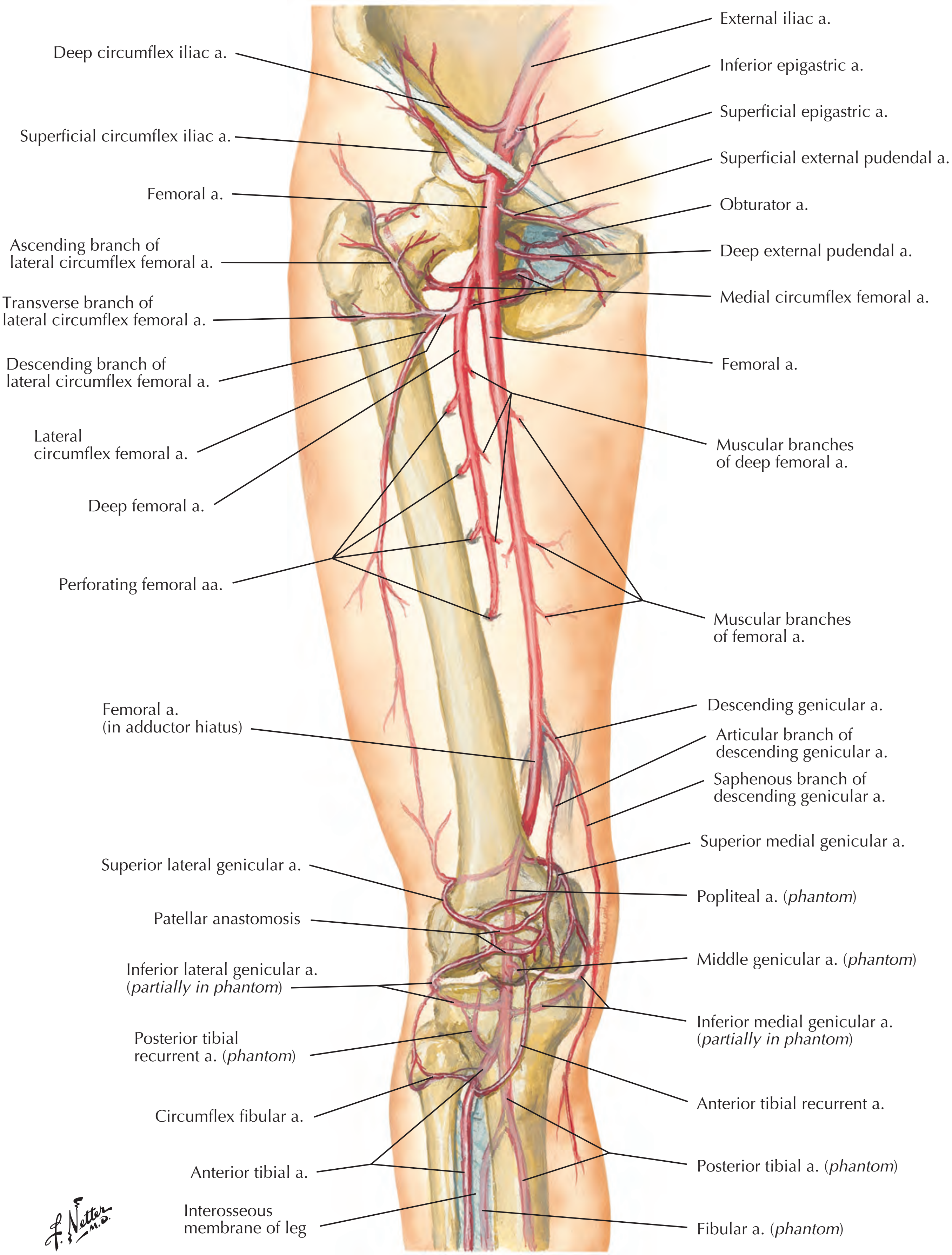
MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT	DISTAL ATTACHMENT	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Extensor hallucis longus	Anterior leg	Middle part of anterior surfaces of fibula and interosseous membrane of leg	Dorsal surface of base of distal phalanx of great toe	Deep fibular nerve	Anterior tibial artery	Extends great toe, dorsiflexes foot
Fibularis brevis m.	Lateral leg	Distal two-thirds of lateral surface of fibula	Dorsal surface of tuberosity on lateral side of 5th metatarsal bone	Superficial fibular nerve	Anterior tibial and fibular arteries	Everts and plantar flexes foot
Fibularis longus m.	Lateral leg	Head of fibula, proximal two-thirds of lateral surface of fibula	Plantar surfaces of base of 1st metatarsal and of medial cuneiform bones	Superficial fibular nerve	Anterior tibial and fibular arteries	Everts and plantar flexes foot
Fibularis tertius m.	Anterior leg	Distal one-third of anterior surfaces of fibula and interosseous membrane of leg	Dorsal surface of base of 5th metatarsal bone	Deep fibular nerve	Anterior tibial artery	Dorsiflexes and everts foot
Flexor digiti minimi of foot	Foot	Base of 5th metatarsal bone	Lateral surface of base of proximal phalanx of 5th digit	Lateral plantar nerve	Lateral plantar artery, plantar digital artery to 5th digit, arcuate artery	Flexes proximal phalanx of 5th digit
Flexor digitorum brevis	Foot	Medial tubercle of tuberosity of calcaneus, plantar aponeurosis, intermuscular septum	Both sides of middle phalangeal bones of digits 2–5	Medial plantar nerve	Medial and lateral plantar arteries, plantar arch, plantar metatarsal and plantar digital arteries	Flexes lateral four digits
Flexor digitorum longus	Posterior leg	Medial part of posterior tibia inferior to soleal line	Plantar surfaces of bases of distal phalanges of digits 2–5	Tibial nerve	Posterior tibial artery	Flexes lateral four digits and plantar flexes foot; supports longitudinal arches of foot
Flexor hallucis brevis	Foot	Plantar surfaces of cuboid bone and lateral cuneiform bone	Both sides of base of proximal phalanx of 1st digit	Medial plantar nerve	Medial plantar and 1st plantar metatarsal arteries	Flexes proximal phalanx of 1st digit
Flexor hallucis longus	Posterior leg	Distal two-thirds of posterior surfaces of fibula and interosseous membrane of leg	Base of distal phalanx of great toe	Tibial nerve	Fibular artery	Flexes all joints of great toe, plantar flexes foot
Gastrocnemius m.	Posterior leg	*Lateral head:* lateral surface of lateral condyle of femur *Medial head:* popliteal surface above medial condyle of femur	Posterior surface of calcaneus (via calcaneal tendon)	Tibial nerve	Popliteal and posterior tibial arteries	Plantar flexes foot, assists in flexion of knee
Gluteus maximus m.	Superficial gluteal	Ilium posterior to posterior gluteal line, dorsal surfaces of sacrum and coccyx, sacrotuberous ligament	Lateral condyle of tibia (via iliotibial tract), gluteal tuberosity of femur	Inferior gluteal nerve	Inferior and superior gluteal arteries	Extends flexed thigh, assists in lateral rotation, and abducts thigh
Gluteus medius m.	Superficial gluteal	Gluteal surface of ilium between anterior and posterior gluteal lines	Lateral surface of greater trochanter of femur	Superior gluteal nerve	Superior gluteal artery	Abducts and medially rotates thigh
Gluteus minimus m.	Superficial gluteal	Gluteal surface of ilium between anterior and inferior gluteal lines	Anterior surface of greater trochanter of femur	Superior gluteal nerve	Superior gluteal artery	Abducts and medially rotates thigh
Gracilis m.	Medial thigh	Body and inferior ramus of pubis	Superior part of medial surface of tibia	Obturator nerve	Deep femoral and medial circumflex femoral arteries	Adducts thigh, flexes and medially rotates leg

MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT	DISTAL ATTACHMENT	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Iliacus m.	Iliopsoas	Superior two-thirds of iliac fossa, iliac crest, ala of sacrum, anterior sacroiliac ligament	Lesser trochanter and body of femur	Femoral nerve	Iliac branch of iliolumbar artery	Flexes thigh
Inferior gemellus m.	Deep gluteal	Ischial tuberosity	Greater trochanter of femur	Nerve to quadratus femoris muscle	Medial circumflex femoral artery	Laterally rotates extended thigh and abducts flexed thigh
Lumbrical mm. of foot	Foot	Tendons of flexor digitorum longus	Medial side of dorsal digital expansions of digits 2–5	*Medial one:* medial plantar nerve *Lateral three:* lateral plantar nerve	Lateral plantar artery, plantar metatarsal arteries	Flex proximal phalanges at metatarsophalangeal joint, extend phalanges at proximal interphalangeal and distal interphalangeal joints
Obturator externus	Medial thigh	Margins of obturator foramen, external surface of obturator membrane	Trochanteric fossa of femur	Obturator nerve	Medial circumflex femoral and obturator arteries	Laterally rotates thigh
Obturator internus	Deep gluteal	Pelvic surface of obturator membrane, margins of obturator foramen	Greater trochanter of femur	Nerve to obturator internus muscle	Internal pudendal and obturator arteries	Laterally rotates extended thigh, abducts flexed thigh
Pectineus m.	Medial thigh	Superior ramus of pubis	Pectineal line of femur	Femoral nerve (sometimes also obturator nerve)	Medial circumflex femoral and obturator arteries	Adducts and flexes thigh
Piriformis m.	Deep gluteal	Anterior surface of sacral segments 2–4, sacrotuberous ligament (inconstant)	Superior border of greater trochanter of femur	Nerve to piriformis muscle	Superior and inferior gluteal arteries, internal pudendal artery	Laterally rotates extended thigh, abducts flexed thigh
Plantar interossei mm.	Foot	Bases and medial sides of 3rd through 5th metatarsals	Medial surfaces of bases of proximal phalangeal bones of digits 3–5	Lateral plantar nerve	Lateral plantar artery, plantar arch, plantar metatarsal and plantar digital arteries	Adduct digits (3–5), flex metatarsophalangeal joint, and extend phalanges
Plantaris m.	Posterior leg	Inferior end of lateral supracondylar line of femur, oblique popliteal ligament	Posterior surface of calcaneus (via calcaneal tendon)	Tibial nerve	Popliteal artery	Weakly assists gastrocnemius
Popliteus m.	Posterior leg	Lateral surface of lateral condyle of femur, lateral meniscus	Posterior tibia superior to soleal line	Tibial nerve	Inferior medial and lateral genicular arteries	Flexes knee
Psoas major	Iliopsoas	Transverse processes of lumbar vertebrae, sides of bodies of T12–L5 vertebrae, intervening intervertebral discs	Lesser trochanter of femur	Anterior rami of L1–L3 spinal nerves	Lumbar branch of iliolumbar artery	Acting superiorly with iliacus, flexes hip; acting inferiorly, flexes vertebral column laterally; used to balance trunk in sitting position; acting inferiorly with iliacus, flexes trunk
Psoas minor	Iliopsoas	Lateral surfaces of bodies of T12 and L1 vertebrae, T12–L1 intervertebral disc	Pectineal line, iliopubic eminence	Anterior ramus of L1 spinal nerve	Lumbar branch of iliolumbar artery	Flexes pelvis on vertebral column
Quadratus femoris m.	Deep gluteal	Lateral margin of ischial tuberosity	Quadrate tubercle	Nerve to quadratus femoris muscle	Medial circumflex femoral artery	Laterally rotates thigh
Quadratus plantae m.	Foot	Medial and lateral margins of plantar surface of calcaneus	Posterolateral edge of flexor digitorum longus tendon	Lateral plantar nerve	Medial and lateral plantar arteries, plantar arch	Corrects for oblique pull of flexor digitorum longus tendon, thus assisting in flexion of digits of foot

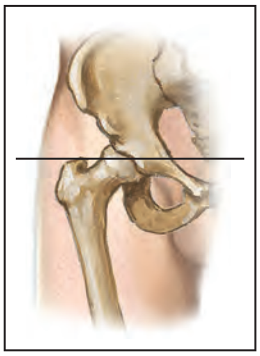
Continued

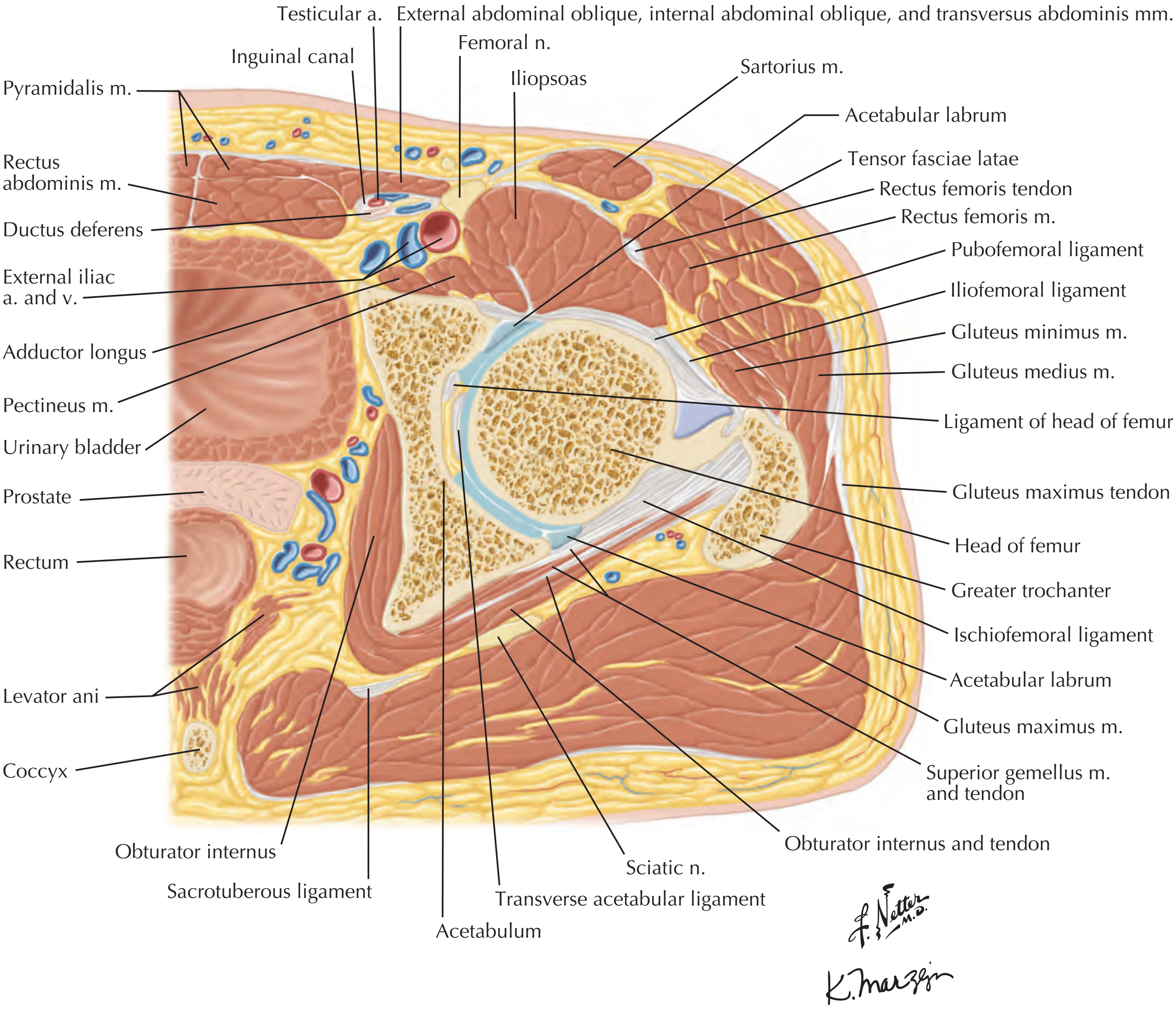
MUSCLE	MUSCLE GROUP	PROXIMAL ATTACHMENT	DISTAL ATTACHMENT	INNERVATION	BLOOD SUPPLY	MAIN ACTIONS
Rectus femoris m.	Anterior thigh (quadriceps femoris)	Anterior inferior iliac spine, ilium superior to acetabulum	Tibial tuberosity (via patellar ligament)	Femoral nerve	Deep femoral and lateral circumflex femoral arteries	Extends leg and flexes thigh
Sartorius m.	Anterior thigh	Anterior superior iliac spine, ilium inferior to that spine	Superior part of medial surface of tibia	Femoral nerve	Femoral artery	Abducts, laterally rotates, and flexes thigh; flexes knee
Semimembranosus m.	Posterior thigh	Ischial tuberosity	Posterior part of medial condyle of tibia	Sciatic nerve (tibial division)	Perforating femoral arteries, medial circumflex femoral artery	Flexes leg, extends thigh
Semitendinosus m.	Posterior thigh	Ischial tuberosity	Superior part of medial surface of tibia	Sciatic nerve (tibial division)	Perforating femoral arteries, medial circumflex femoral artery	Flexes leg, extends thigh
Soleus m.	Posterior leg	Posterior surface of head of fibula, proximal one-fourth of posterior surface of fibula, soleal line of tibia	Posterior surface of calcaneus (via calcaneal tendon)	Tibial nerve	Popliteal, posterior tibial, and fibular arteries	Plantar flexes foot
Superior gemellus m.	Deep gluteal	External surface of ischial spine	Medial surface of greater trochanter of femur	Nerve to obturator internus muscle	Inferior gluteal and internal pudendal arteries	Laterally rotates extended thigh and abducts flexed thigh
Tensor fasciae latae	Superficial gluteal	Anterior superior iliac spine, anterior part of iliac crest	Lateral condyle of tibia (via iliotibial tract)	Superior gluteal nerve	Ascending branch of lateral circumflex femoral artery	Abducts, medially rotates, and flexes thigh; helps to keep knee extended
Tibialis anterior m.	Anterior leg	Lateral condyle of tibia, proximal half of lateral tibia, interosseous membrane of leg	Medial cuneiform bone and base of 1st metatarsal bone	Deep fibular nerve	Anterior tibial artery	Dorsiflexes foot and inverts foot
Tibialis posterior m.	Posterior leg	Posterior tibia below soleal line, interosseous membrane, proximal half of posterior fibula	Tuberosity of navicular bone, all cuneiform bones, cuboid bone, bases of 2nd through 4th metatarsal bones	Tibial nerve	Fibular artery	Plantar flexes foot and inverts foot
Vastus intermedius m.	Anterior thigh (quadriceps femoris)	Anterior and lateral surfaces of body of femur	Tibial tuberosity (via patellar ligament)	Femoral nerve	Lateral circumflex femoral and deep femoral arteries	Extends leg
Vastus lateralis m.	Anterior thigh (quadriceps femoris)	Greater trochanter, gluteal tuberosity, lateral lip of linea aspera	Tibial tuberosity (via patellar ligament)	Femoral nerve	Lateral circumflex femoral and deep femoral arteries	Extends leg
Vastus medialis m.	Anterior thigh (quadriceps femoris)	Intertrochanteric line, greater trochanter, gluteal tuberosity, lateral lip of linea aspera	Tibial tuberosity (via patellar ligament)	Femoral nerve	Femoral and deep femoral arteries	Extends leg

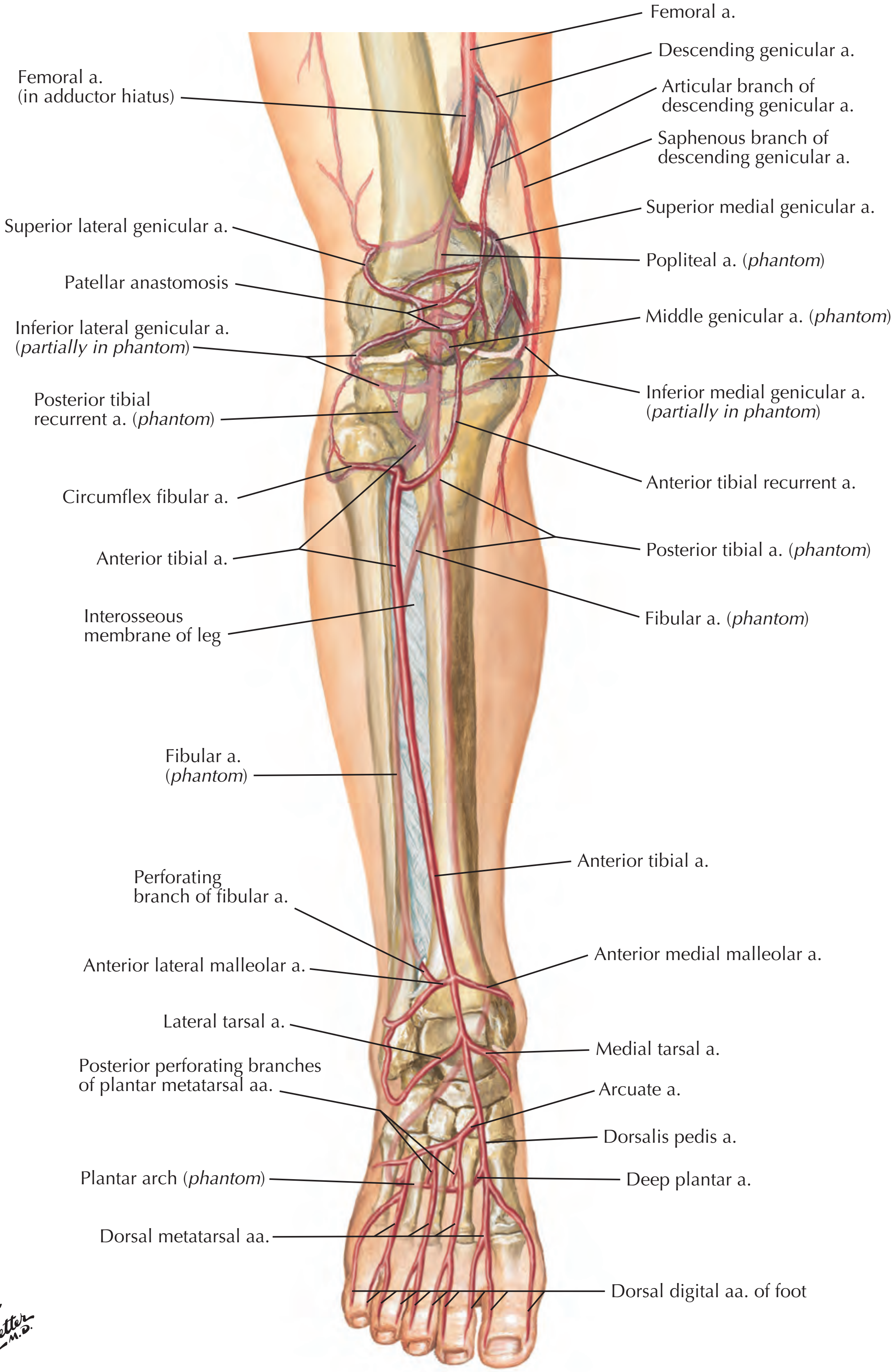
Variations in spinal nerve contributions to the innervation of muscles, their arterial supply, their attachments, and their actions are common themes in human anatomy. Therefore, expect differences between texts and realize that anatomical variation is normal.

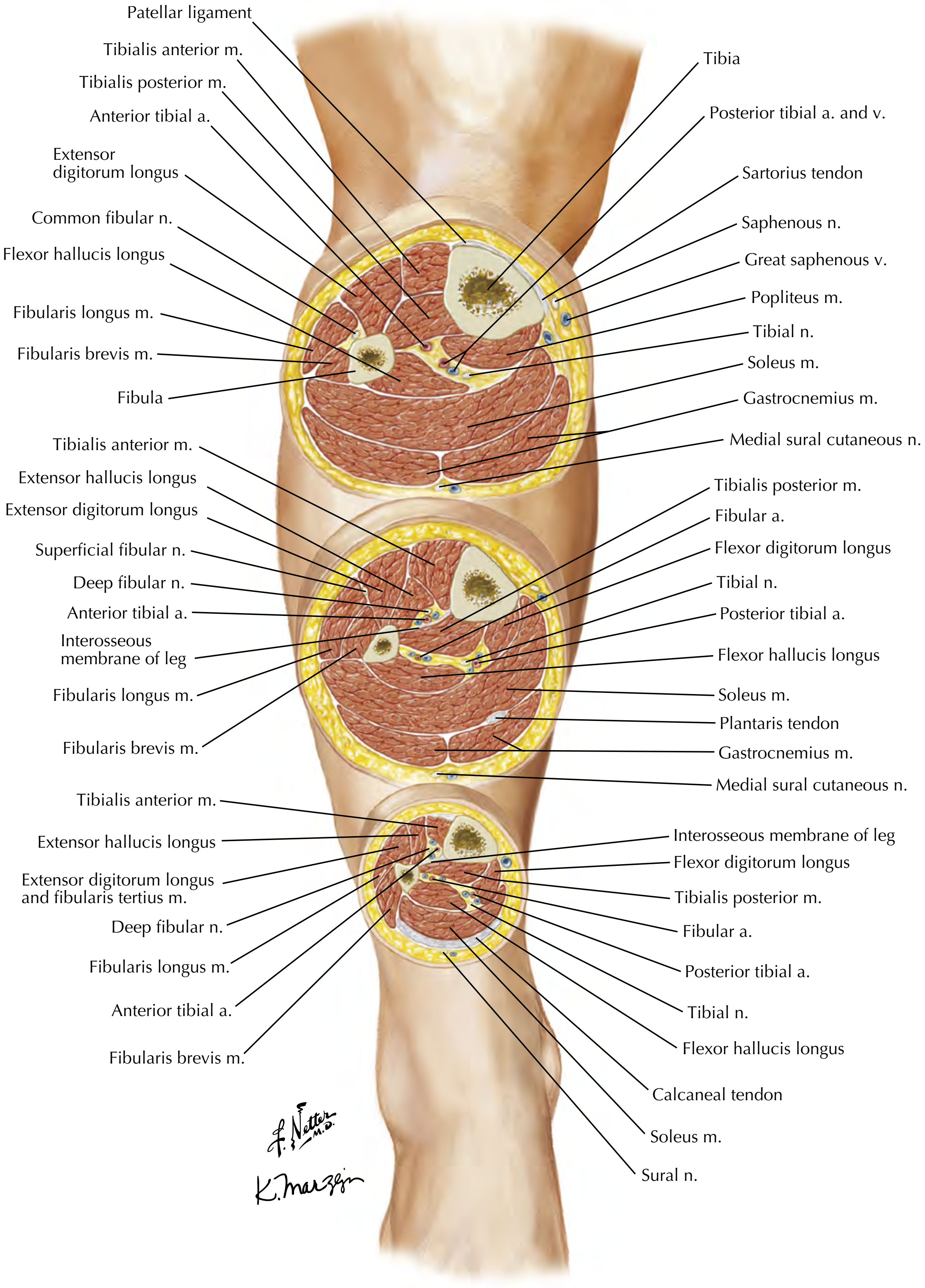

External iliac a.
Deep circumflex iliac a.
Inferior epigastric a.
Superficial epigastric a.
Superficial circumflex iliac a.
Superficial external pudendal a.
Femoral a.
Obturator a.
Ascending branch of lateral circumflex femoral a.
Deep external pudendal a.
Medial circumflex femoral a.
Transverse branch of lateral circumflex femoral a.
Descending branch of lateral circumflex femoral a.
Femoral a.
Lateral circumflex femoral a.
Muscular branches of deep femoral a.
Deep femoral a.
Perforating femoral aa.
Muscular branches of femoral a.
Femoral a. (in adductor hiatus)
Descending genicular a.
Articular branch of descending genicular a.
Saphenous branch of descending genicular a.
Superior medial genicular a.
Superior lateral genicular a.
Popliteal a. (*phantom*)
Patellar anastomosis
Middle genicular a. (*phantom*)
Inferior lateral genicular a. (*partially in phantom*)
Inferior medial genicular a. (*partially in phantom*)
Posterior tibial recurrent a. (*phantom*)
Anterior tibial recurrent a.
Circumflex fibular a.
Posterior tibial a. (*phantom*)
Anterior tibial a.
Interosseous membrane of leg
Fibular a. (*phantom*)
F. Netter M.D.

Cross-Sectional Anatomy of Hip: Axial View




Testicular a.
External abdominal oblique, internal abdominal oblique, and transversus abdominis mm.
Femoral n.
Inguinal canal
Iliopsoas
Sartorius m.
Pyramidalis m.
Acetabular labrum
Rectus abdominis m.
Tensor fasciae latae
Rectus femoris tendon
Ductus deferens
Rectus femoris m.
Pubofemoral ligament
External iliac a. and v.
Iliofemoral ligament
Adductor longus
Gluteus minimus m.
Gluteus medius m.
Pectineus m.
Ligament of head of femur
Urinary bladder
Gluteus maximus tendon
Prostate
Head of femur
Rectum
Greater trochanter
Ischiofemoral ligament
Levator ani
Acetabular labrum
Gluteus maximus m.
Coccyx
Superior gemellus m. and tendon
Obturator internus and tendon
Obturator internus
Sciatic n.
Sacrotuberous ligament
Transverse acetabular ligament
Acetabulum


Femoral a.
Descending genicular a.
Articular branch of descending genicular a.
Saphenous branch of descending genicular a.
Superior medial genicular a.
Popliteal a. (*phantom*)
Middle genicular a. (*phantom*)
Inferior medial genicular a. (*partially in phantom*)
Anterior tibial recurrent a.
Posterior tibial a. (*phantom*)
Fibular a. (*phantom*)
Femoral a. (in adductor hiatus)
Superior lateral genicular a.
Patellar anastomosis
Inferior lateral genicular a. (*partially in phantom*)
Posterior tibial recurrent a. (*phantom*)
Circumflex fibular a.
Anterior tibial a.
Interosseous membrane of leg
Fibular a. (*phantom*)
Anterior tibial a.
Perforating branch of fibular a.
Anterior lateral malleolar a.
Anterior medial malleolar a.
Lateral tarsal a.
Medial tarsal a.
Posterior perforating branches of plantar metatarsal aa.
Arcuate a.
Dorsalis pedis a.
Plantar arch (*phantom*)
Deep plantar a.
Dorsal metatarsal aa.
Dorsal digital aa. of foot


Patellar ligament
Tibialis anterior m.
Tibialis posterior m.
Anterior tibial a.
Extensor digitorum longus
Common fibular n.
Flexor hallucis longus
Fibularis longus m.
Fibularis brevis m.
Fibula
Tibia
Posterior tibial a. and v.
Sartorius tendon
Saphenous n.
Great saphenous v.
Popliteus m.
Tibial n.
Soleus m.
Gastrocnemius m.
Medial sural cutaneous n.
Tibialis anterior m.
Extensor hallucis longus
Extensor digitorum longus
Superficial fibular n.
Deep fibular n.
Anterior tibial a.
Interosseous membrane of leg
Fibularis longus m.
Fibularis brevis m.
Tibialis posterior m.
Fibular a.
Flexor digitorum longus
Tibial n.
Posterior tibial a.
Flexor hallucis longus
Soleus m.
Plantaris tendon
Gastrocnemius m.
Medial sural cutaneous n.
Tibialis anterior m.
Extensor hallucis longus
Extensor digitorum longus and fibularis tertius m.
Deep fibular n.
Fibularis longus m.
Anterior tibial a.
Fibularis brevis m.
Interosseous membrane of leg
Flexor digitorum longus
Tibialis posterior m.
Fibular a.
Posterior tibial a.
Tibial n.
Flexor hallucis longus
Calcaneal tendon
Soleus m.
Sural n.
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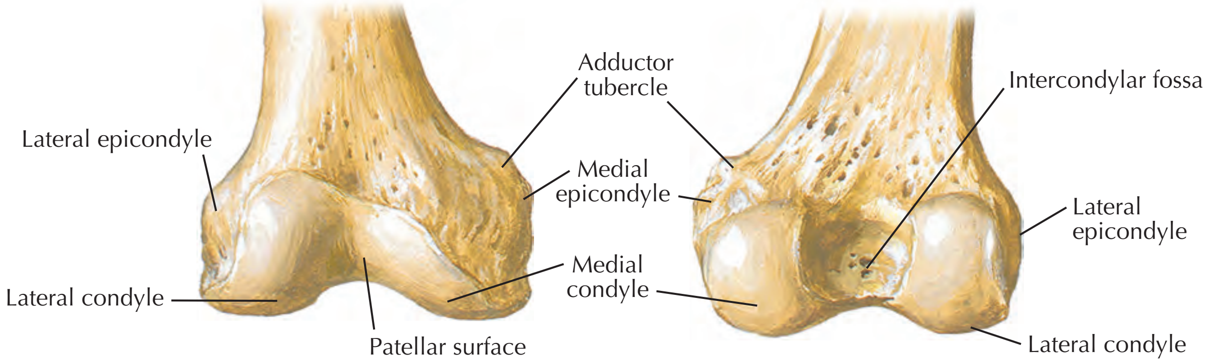
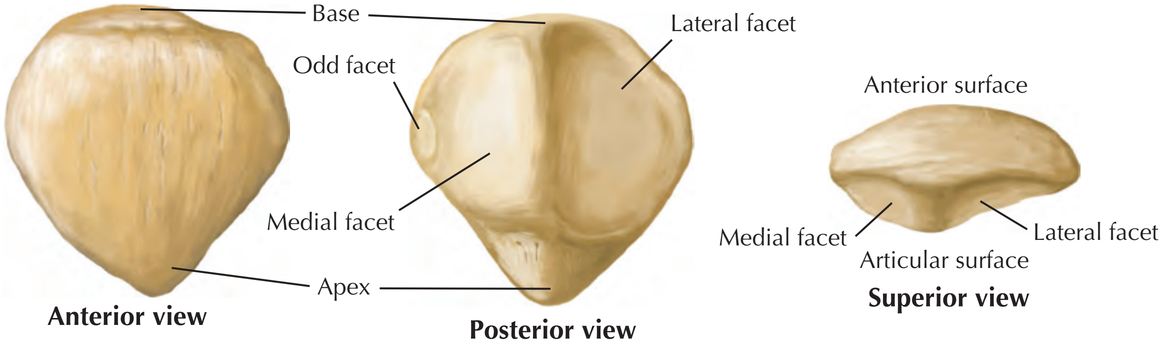
K. Marzen


Lateral epicondyle
Adductor tubercle
Medial epicondyle
Lateral condyle
Medial condyle
Patellar surface
Intercondylar fossa
Lateral epicondyle
Medial condyle
Lateral condyle

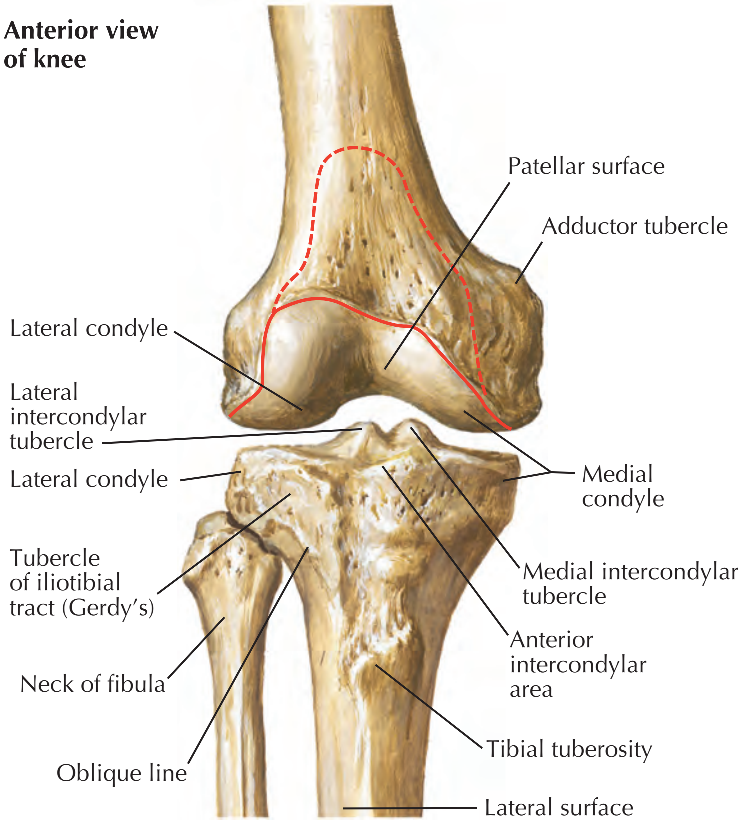

Base
Odd facet
Lateral facet
Medial facet
Apex
Anterior surface
Medial facet
Lateral facet
Articular surface

Anterior view

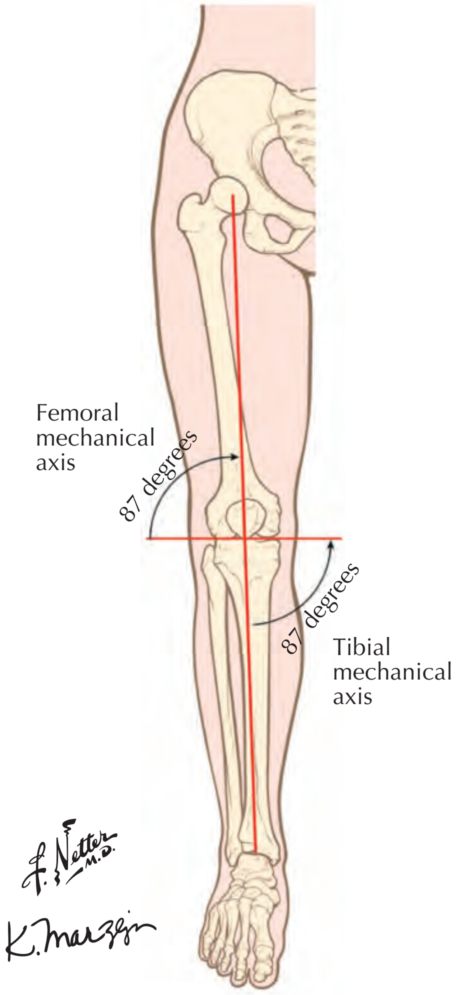
Posterior view

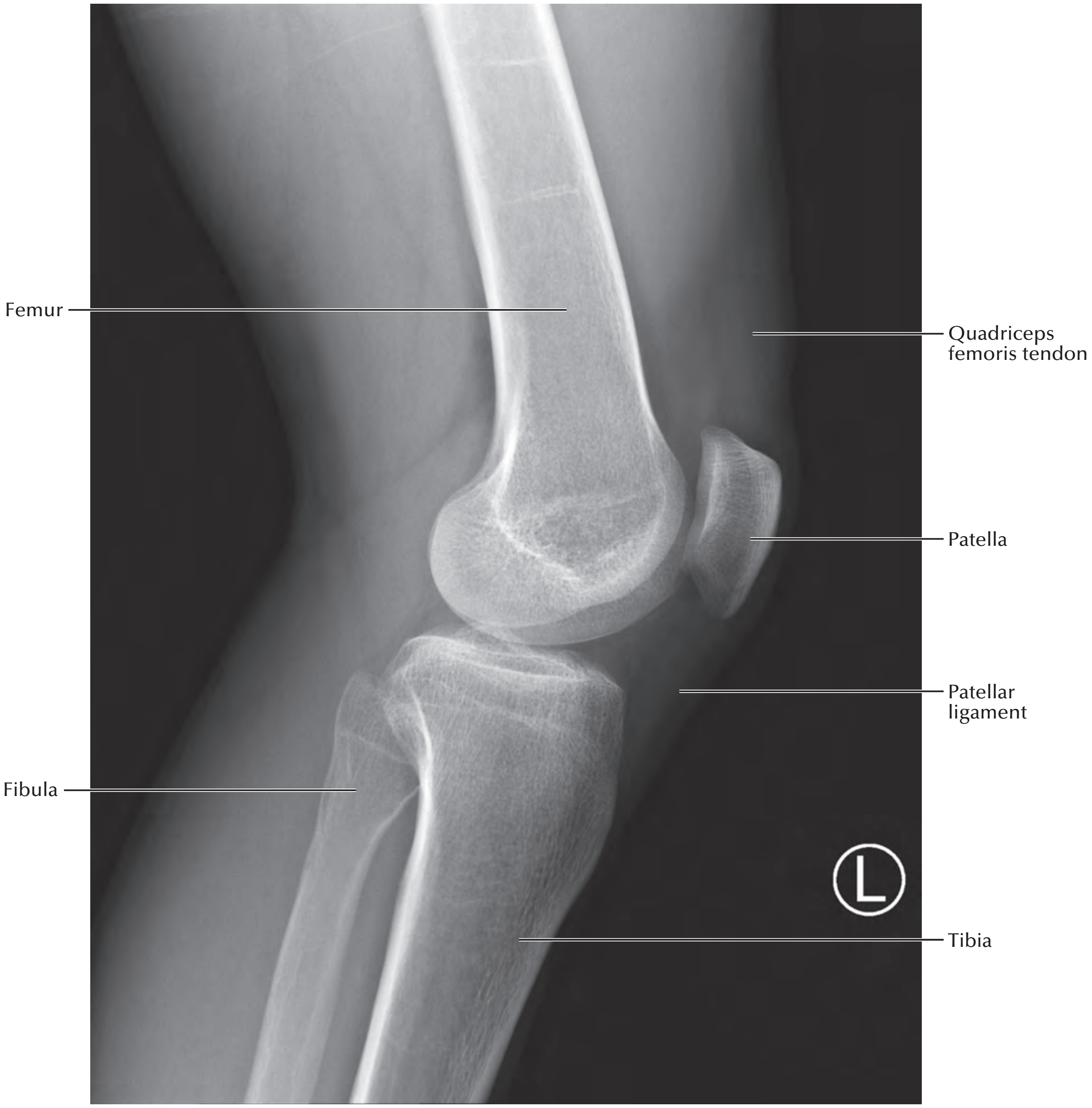
Superior view

Anterior view of knee

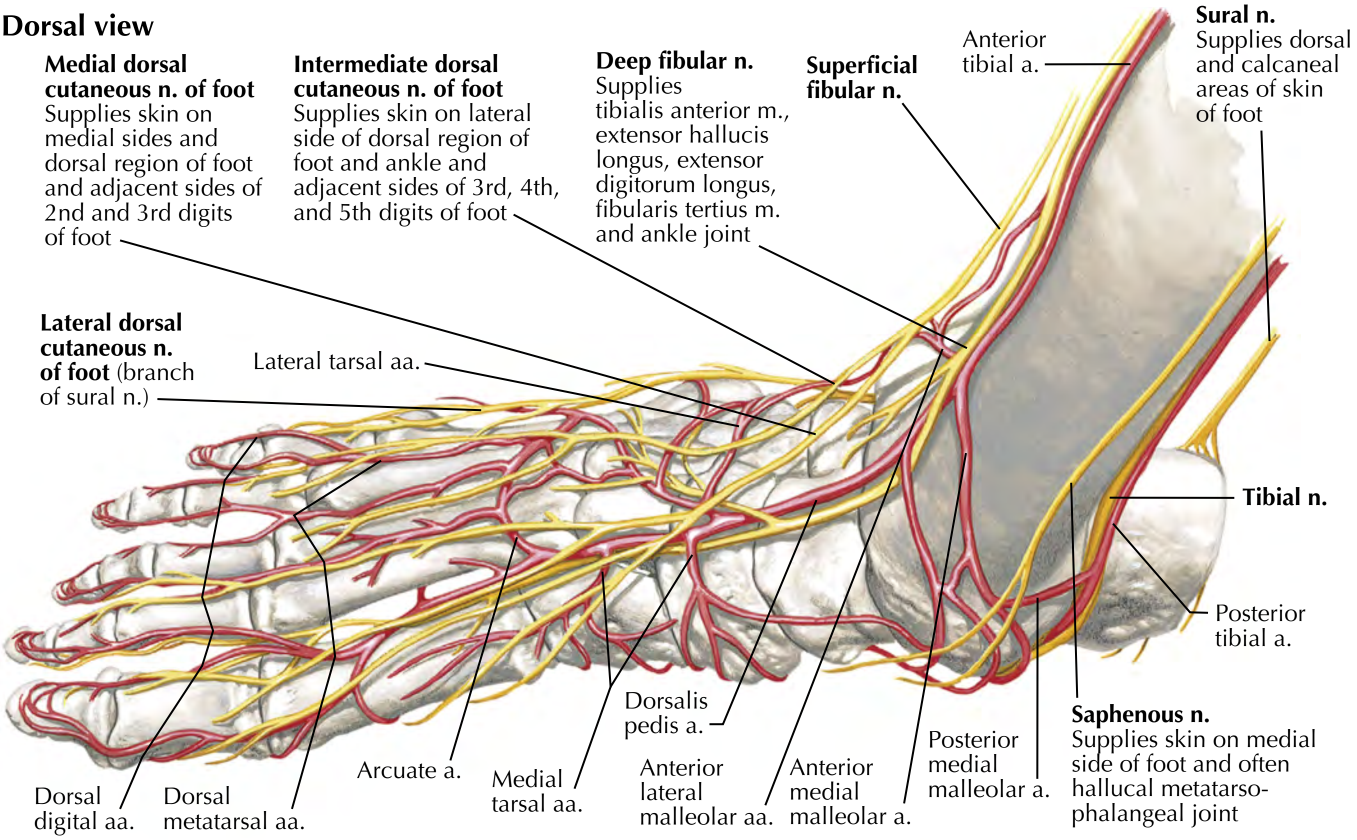

Patellar surface
Adductor tubercle
Lateral condyle
Lateral intercondylar tubercle
Lateral condyle
Medial condyle
Tubercle of iliotibial tract (Gerdy's)
Medial intercondylar tubercle
Anterior intercondylar area
Neck of fibula
Oblique line
Tibial tuberosity
Lateral surface

━━	Line of attachment of synovium (edge of articular cartilage) to distal femur
- - -	Upper limit of suprapatellar bursa

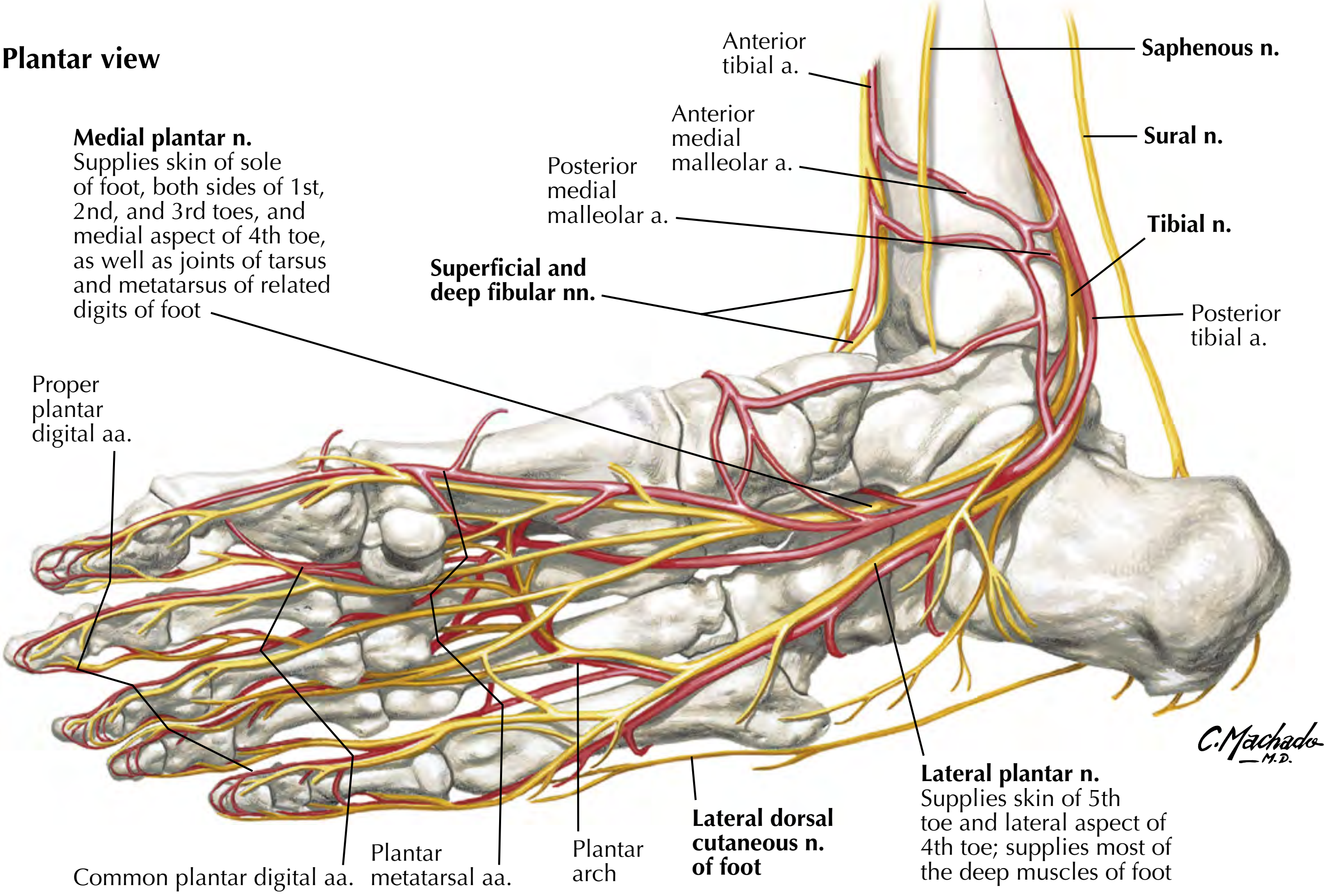

Femoral mechanical axis
87 degrees
87 degrees
Tibial mechanical axis
F. Netter M.D.
K. Marzen


Femur
Quadriceps femoris tendon
Patella
Patellar ligament
Fibula
L
Tibia

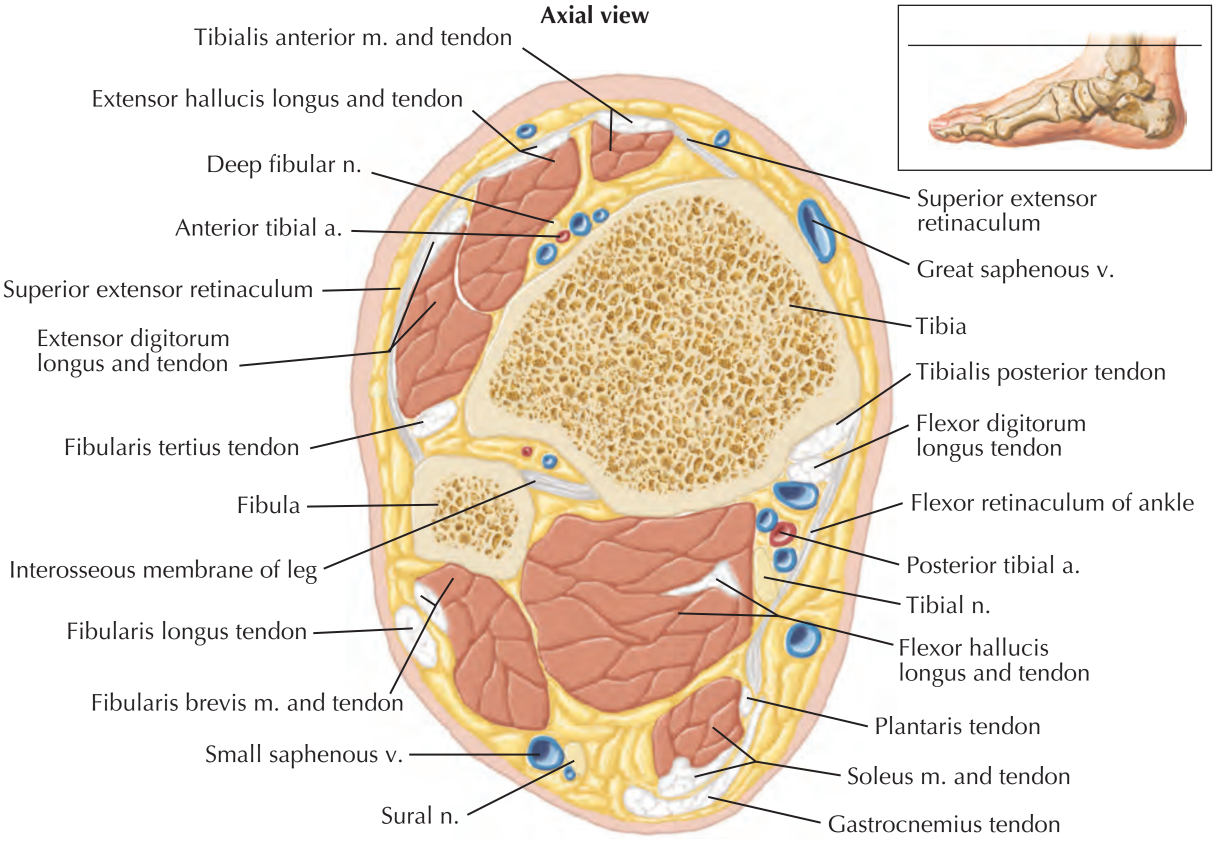
Dorsal view

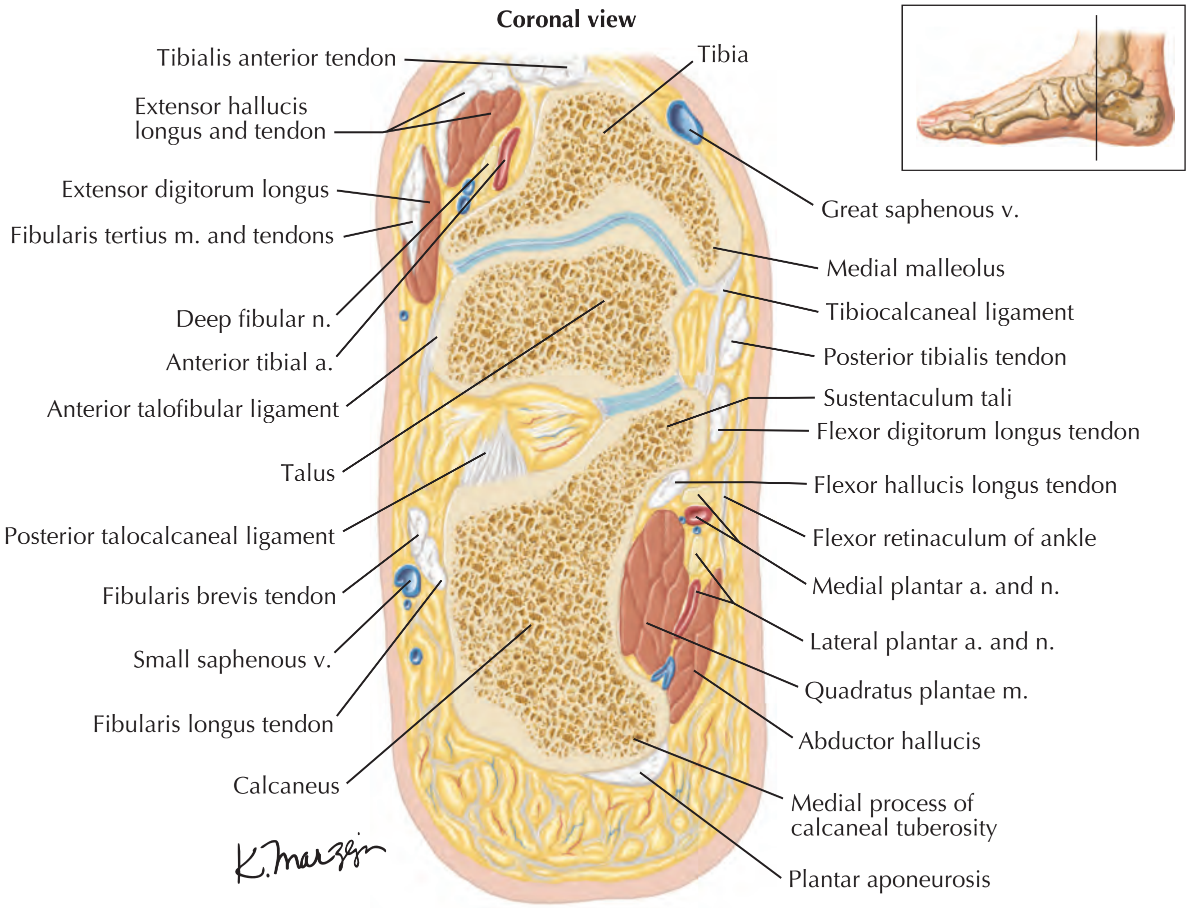

Medial dorsal cutaneous n. of foot
Supplies skin on medial sides and dorsal region of foot and adjacent sides of 2nd and 3rd digits of foot
Intermediate dorsal cutaneous n. of foot
Supplies skin on lateral side of dorsal region of foot and ankle and adjacent sides of 3rd, 4th, and 5th digits of foot
Deep fibular n.
Supplies tibialis anterior m., extensor hallucis longus, extensor digitorum longus, fibularis tertius m. and ankle joint
Superficial fibular n.
Anterior tibial a.
Sural n.
Supplies dorsal and calcaneal areas of skin of foot
Lateral dorsal cutaneous n. of foot (branch of sural n.)
Lateral tarsal aa.
Tibial n.
Posterior tibial a.
Saphenous n.
Supplies skin on medial side of foot and often hallucal metatarso-phalangeal joint
Posterior medial malleolar a.
Anterior medial malleolar a.
Anterior lateral malleolar aa.
Dorsalis pedis a.
Medial tarsal aa.
Arcuate a.
Dorsal digital aa.
Dorsal metatarsal aa.

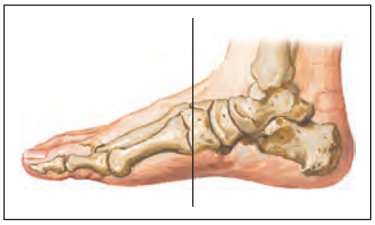
Plantar view


Anterior tibial a.
Saphenous n.
Anterior medial malleolar a.
Sural n.
Posterior medial malleolar a.
Tibial n.
Medial plantar n.
Supplies skin of sole of foot, both sides of 1st, 2nd, and 3rd toes, and medial aspect of 4th toe, as well as joints of tarsus and metatarsus of related digits of foot
Superficial and deep fibular nn.
Posterior tibial a.
Proper plantar digital aa.
C. Machado M.D.
Lateral plantar n.
Supplies skin of 5th toe and lateral aspect of 4th toe; supplies most of the deep muscles of foot
Lateral dorsal cutaneous n. of foot
Plantar arch
Plantar metatarsal aa.
Common plantar digital aa.

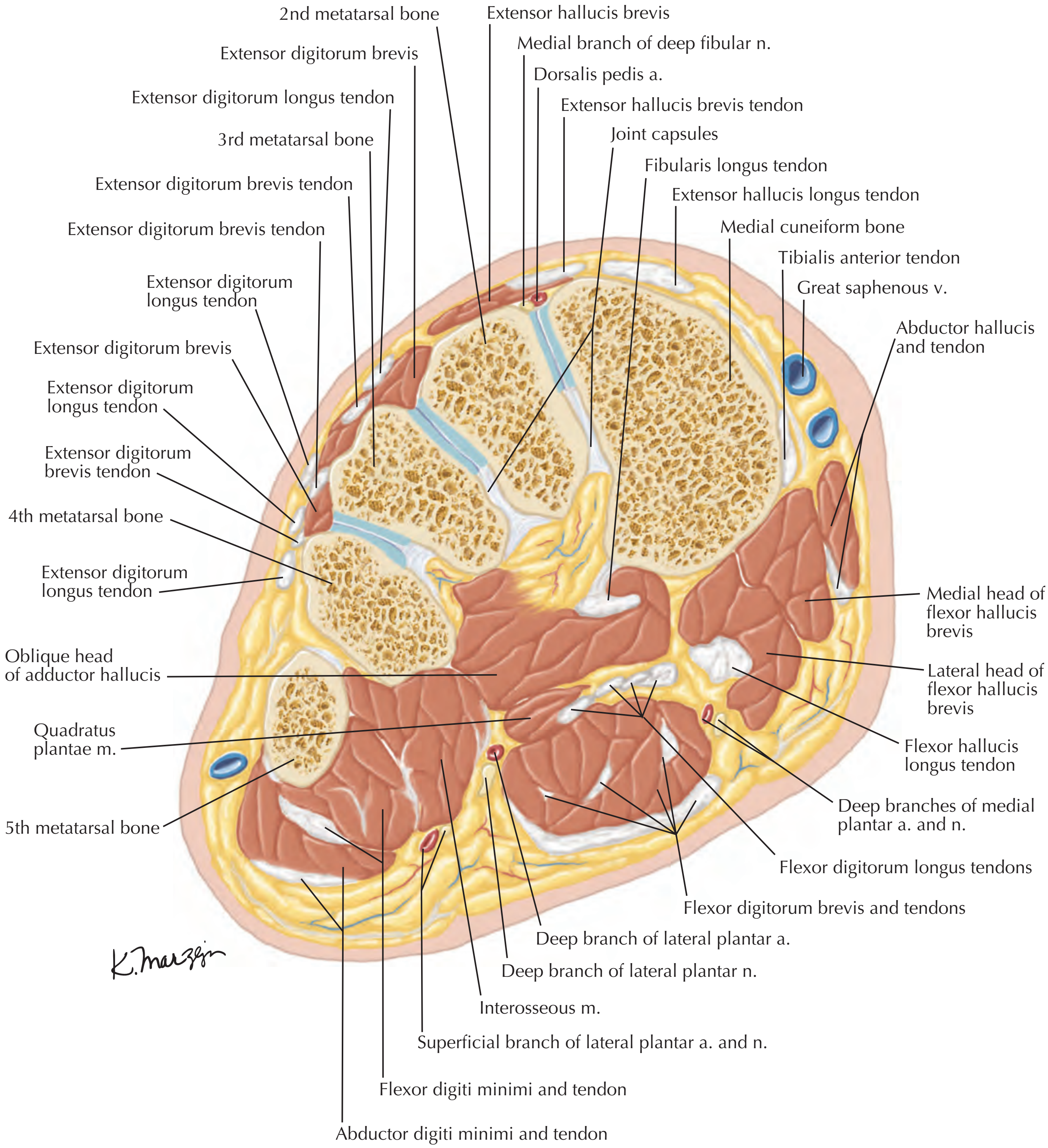
Cross-Sectional Anatomy of Ankle and Foot


Axial view
Tibialis anterior m. and tendon
Extensor hallucis longus and tendon
Deep fibular n.
Anterior tibial a.
Superior extensor retinaculum
Extensor digitorum longus and tendon
Fibularis tertius tendon
Fibula
Interosseous membrane of leg
Fibularis longus tendon
Fibularis brevis m. and tendon
Small saphenous v.
Sural n.
Superior extensor retinaculum
Great saphenous v.
Tibia
Tibialis posterior tendon
Flexor digitorum longus tendon
Flexor retinaculum of ankle
Posterior tibial a.
Tibial n.
Flexor hallucis longus and tendon
Plantaris tendon
Soleus m. and tendon
Gastrocnemius tendon

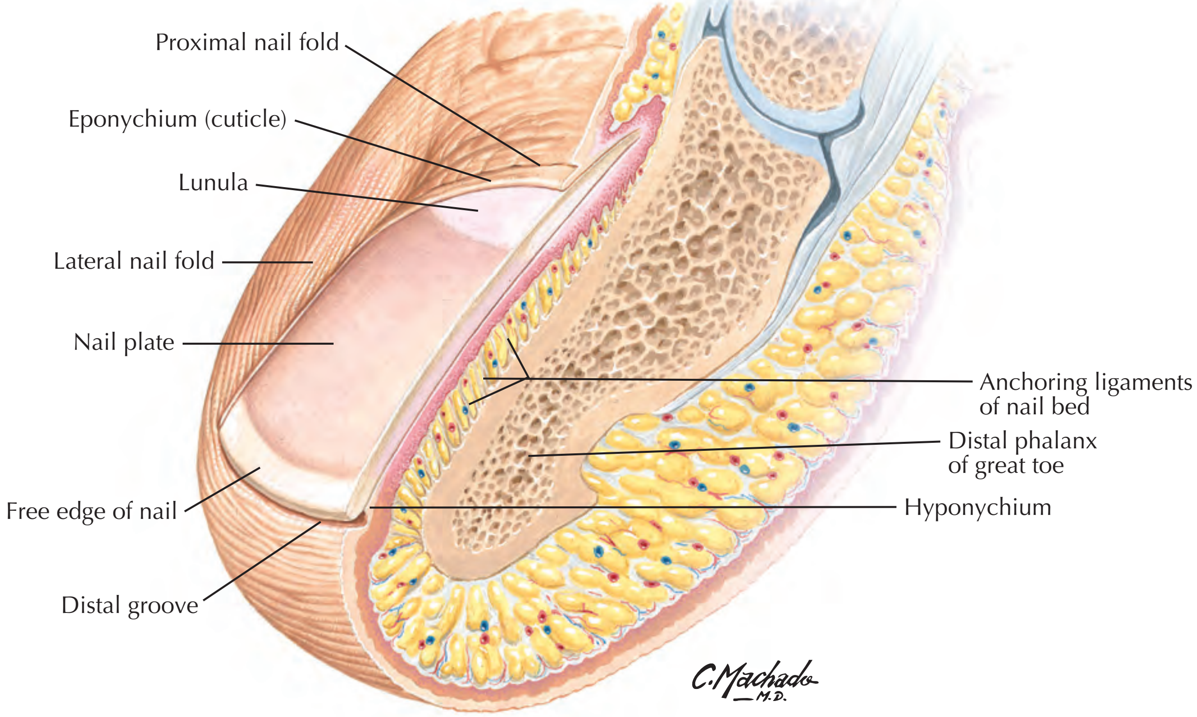

Coronal view
Tibialis anterior tendon
Extensor hallucis longus and tendon
Extensor digitorum longus
Fibularis tertius m. and tendons
Deep fibular n.
Anterior tibial a.
Anterior talofibular ligament
Talus
Posterior talocalcaneal ligament
Fibularis brevis tendon
Small saphenous v.
Fibularis longus tendon
Calcaneus
Tibia
Great saphenous v.
Medial malleolus
Tibiocalcaneal ligament
Posterior tibialis tendon
Sustentaculum tali
Flexor digitorum longus tendon
Flexor hallucis longus tendon
Flexor retinaculum of ankle
Medial plantar a. and n.
Lateral plantar a. and n.
Quadratus plantae m.
Abductor hallucis
Medial process of calcaneal tuberosity
Plantar aponeurosis



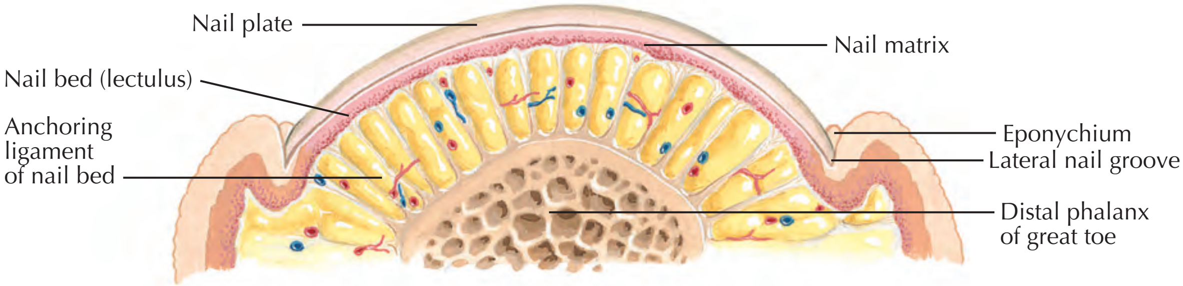
Coronal view


2nd metatarsal bone
Extensor digitorum brevis
Extensor digitorum longus tendon
3rd metatarsal bone
Extensor digitorum brevis tendon
Extensor digitorum brevis tendon
Extensor digitorum longus tendon
Extensor digitorum brevis
Extensor digitorum longus tendon
Extensor digitorum brevis tendon
4th metatarsal bone
Extensor digitorum longus tendon
Oblique head of adductor hallucis
Quadratus plantae m.
5th metatarsal bone
Extensor hallucis brevis
Medial branch of deep fibular n.
Dorsalis pedis a.
Extensor hallucis brevis tendon
Joint capsules
Fibularis longus tendon
Extensor hallucis longus tendon
Medial cuneiform bone
Tibialis anterior tendon
Great saphenous v.
Abductor hallucis and tendon
Medial head of flexor hallucis brevis
Lateral head of flexor hallucis brevis
Flexor hallucis longus tendon
Deep branches of medial plantar a. and n.
Flexor digitorum longus tendons
Flexor digitorum brevis and tendons
Deep branch of lateral plantar a.
Deep branch of lateral plantar n.
Interosseous m.
Superficial branch of lateral plantar a. and n.
Flexor digiti minimi and tendon
Abductor digiti minimi and tendon
K. Marzen

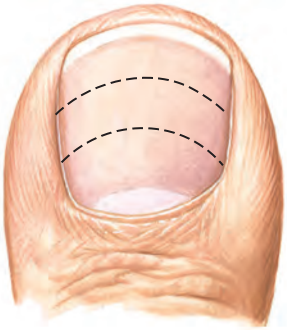
Anatomy of the Toenail


Proximal nail fold
Eponychium (cuticle)
Lunula
Lateral nail fold
Nail plate
Free edge of nail
Distal groove
Anchoring ligaments of nail bed
Distal phalanx of great toe
Hyponychium
C.Machado M.D.

Sagittal section of great toe


Nail plate
Nail bed (lectulus)
Anchoring ligament of nail bed
Nail matrix
Eponychium
Lateral nail groove
Distal phalanx of great toe

Cross section of toenail



Toenail growth

The average growth rate of toenails is about 1 mm a month.

The rounded shape of the free edge of the nails is dictated by the shape of the lunula. After avulsion of a nail, the free edge of the new one grows parallel to the lunula.

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